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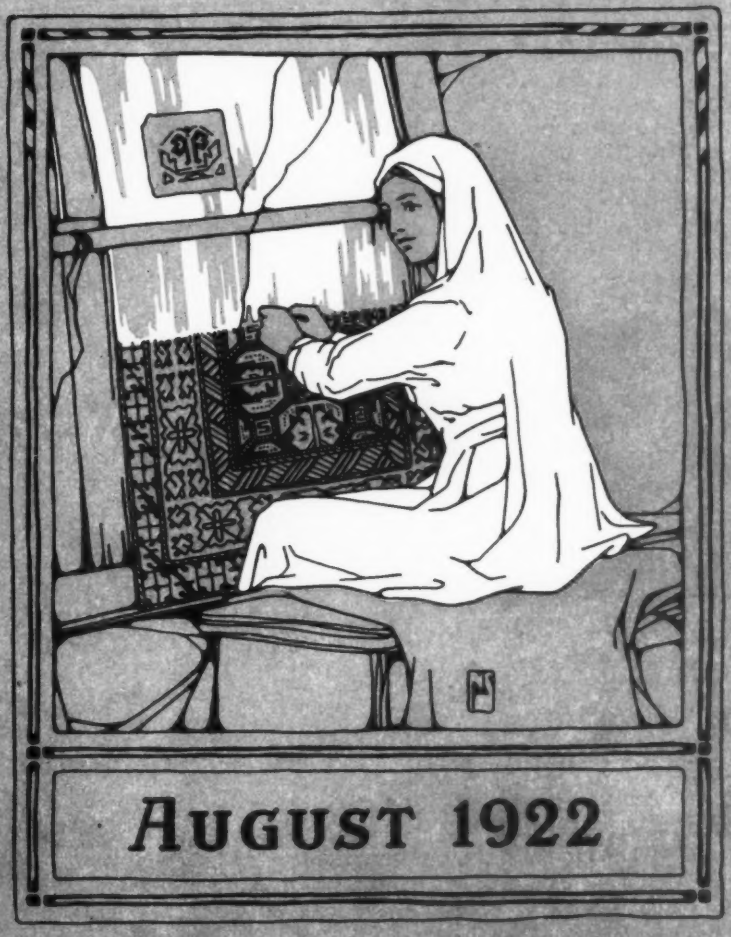

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INDUSTRIAL-ARTS MAGAZINE

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The Vocational and Educational Guidance Program of the Junior High School

Dana Z. Eckert, Head Teacher and Vocational Counseler, Latimer Junior High School, Pittsburgh, Pa.

THERE is probably not one authority on junior high school administration, methods, curriculum or principles who does not stress the large place that must be given to vocational and educational guidance in this new type of school. The degree or amount of emphasis will vary, but all who are interested in the movement now growing so rapidly agree that one of the fundamental principles upon which the junior high school is based is that of guidance.

The early adolescent boy and girl need this guidance and direction. Their minds and purposes are more or less unstable. Their plans are ephemeral. They look forward to becoming famous in business this week and have dedicated their future energies to the field of aviation before another week has passed. They are not aware of their potentialities. It is as one of these pupils said not long ago, "When C——— used to be up at the other school, (the elementary school) he didn't know he could draw; now he's about the best drawer in the school." This pupil had found out that same truth which all of us who are working on the problems of the junior high school must find out—the school must provide opportunities for boys and girls to unearth their hidden talents.

And after the student has discovered his individual capabilities, his strong points as well as his weak ones, then he must be given intelligent guidance and direction so that those capacities may be developed as much as possible. When this principle has been adopted by the principal and faculty of a school it will affect the whole administration of the school. Curriculum, activities, school citizenship, in fact everything will become subordinated to this central idea. It will become the unifying element, the heart of the whole school if it has once been accepted in its full meaning.

This paper will attempt to set forth a statement of certain phases of guidance which have been considered necessary in the Latimer Junior High School. The paper is not a mere exposition of guidance theory but is rather a report of certain types of guidance now being used in this school. For convenience of outline they have been arranged under the six following heads:

I Classification.
II Try-out Courses.
III Vocational Information Classes.
IV Report Teachers' Conferences.
V Visitation of Elementary Schools by Vocational Counselor.
VI Vocational Counselor's Conferences.

The fact of individual differences is established. All seventh grade pupils, therefore, who enter Latimer are classified into groups on the basis of ratings in the standardized intelligence and achievement tests administered to them by the department of measurement. The ratings of their former teachers are always considered along with the intelligence ratings in making such classification. We have found that this method of grouping gives us groups that are unquestionably more nearly similar in ability than any other plan of grouping which had been tried previously. It provides for bright and dull pupil alike a wider opportunity than was possible where such pupils were together in the same class. It develops qualities of leadership and creates a feeling of pride in accomplishment in a way that would never have been possible where the bright and versatile pupil was grouped with the slow, plodding boy or girl. Some of the opponents of such classification criticise it on the grounds that it will create a class of intellectual snobs. We have not found evidences of it in the five semesters during which we have tried it. As a matter of fact the students are quite unaware of any such plan of classification. Students from slow groups sit as representatives of their classes on an equality with those from the other groups in the student council; they serve in places of responsibility with as much honor to themselves and their class as any others; in fact there is no hint or allusion ever made which in any way can attach a stigma to such a group. And what is really of most importance to the individual boy or girl is the fact that by this plan he or she can discover his potential capacities to a far greater extent and under far more favorable conditions than

he could by any other way. So highly do we think of homogeneous grouping that this semester we have in our school:

Thirteen classes of seventh grade pupils classified on the basis of their I. Q.

Three classes of 9A academic pupils grouped on this basis in mathematics, English, and in foreign language.

Four classes of Eighth grade academic pupils grouped on the same basis.

The second type of guidance used at Latimer is that of the tryout course. All boys who are in the seventh grade are given at least a semester's work in the general shop. The work of this shop is so arranged that boys are given a five weeks' course in at least four of the six kinds of shop work offered in the type shops of the school. Thus the boy and the shop instructor have an opportunity to discover any particular aptitudes for one or another kind of hand work. This shop is equipped for instruction in wood bench work, wood turning, printing, sheet-metal, electricity and for light machine work. Unfortunately, the boy's sister has not such a varied field from which to select. (Her tryout courses are limited to cooking and sewing.) Here is an open field for some resourceful teacher of household arts to develop other courses of instruction which shall serve the same purpose for girls of this grade as the general shop serves for the boys. It must be admitted that it is difficult to find an instructor who can teach from four to six or seven kinds of shop work and who can organize his work in such a way that he can keep as many kinds of work going at one time in one shop. But once you have found such a man this kind of course certainly provides a valuable means of helping boys "find" themselves.

Following the work of the seventh year, Latimer pupils have the opportunity of selecting the curriculum or "course" which they wish to follow. Careful preparation is made for securing the wisest possible choice. More will be said of this preparation in the discussion of the report teachers' conferences and of the vocational counselor's conferences. After this choice has been made and given a trial the pupil has the opportunity of changing his course at the end of the first or second semester. In fact, there is no rule nor practice of the school which prevents the student from making such a change at any time throughout his whole junior high school life provided it is evident that by such a change he will be given a better chance to succeed. This type of organization would be best illustrated graphically by a main highway traveled by all pupils alike during the seventh year. At the close of the seventh year the pupil comes to a "fork in the road." Here stands a signpost with four "arms," one pointing to the academic course, one to the commercial course, one to the technical course and the fourth to the vocational course. The general direction of these roads is the same. They are only slightly divergent at first. There are numerous connecting paths and roads by which the traveler on one can easily pass over to another.

It is evident, then, that any of these courses may be carried by a pupil for a year or more as a more extended tryout course. If he finds it suited to his taste he may continue it in the senior high school. If it is unsuited to his liking or to his vocational plans he may change anywhere along the line.

A third kind of try-out course is provided by the plan of "rotation of shops" which is a part of the technical course for boys. This plan assigns the boy who selects this course to ten weeks' instruction in one shop. At the end of that time he is moved on to another shop, and so on during the two, or four semesters of his course. This "rotation" plan merely gives a more extended tryout than the general shop. He has ten weeks instead of five, and he receives instruction in a shop where nothing but that one kind of work is taught.

Latimer feels the need which is no doubt felt by other schools of having try-out courses in foreign language, and in commercial subjects which will provide material which is significant and valuable, but which need not be carried over a longer period than ten or twenty weeks. The place for such work would probably be in the upper seventh grade or the lower eighth grade.

A valuable kind of guidance which may be given in any high school, no matter how small the enrollment, is that which is indicated by the heading "vocational information classes." This does not include the composition work in English which has been advocated by some writers, though the English course of study in Latimer does provide for and require at least two themes each semester on topics which have guidance significance. Perhaps we may digress here for just a moment to mention the changing points of view in these compositions as the student progresses from semester to semester through the three years of his junior high school English. They may be tabulated in the following order:

7B To learn the pupil's interests and environment in order to stimulate his ambition.

7A To stimulate ambition. (Biographical themes)

8B To awaken a realization of individual characteristics and of the possibilities for future development.

8A To turn the student's thought to the opportunities for choice of life work.

9B To develop the idea of social service.

9A To appreciate the personal value of continued education.

The "information" classes, of course, provide for some written work, but the pupils have a regular course of study covering a semester. Textbook and reference-book study is made the basis of class discussions. This

work is given in place of the usual 9B ancient history. It is the course in social science for that semester and is followed up by a semester's work in economic civics.

It is a required course for all students electing the commercial, the technical, or the vocational course and is an elective course for academic pupils. The latter students are usually about evenly divided between the work in general science and the courses in social science.

4 The fourth kind of guidance may be given through conferences between the report teacher and her class. The school program at Latimer is so arranged that one period each morning, known as the activities period, is given over to the numerous activities in which boys and girls of junior high school age are interested. These activities include all kinds of clubs,—nature study, musical, science, radio, boy and girl scouts, etc. For each of these there is a regular assignment of place and day. Tuesday has been kept open for the report teacher to get acquainted with her home room class. She can learn about home conditions, about vocational plans and aspirations; she checks up on pupils who are falling behind in other school work. She can often anticipate a case of dropping out of school and can aid the counselor in retaining the child in school. Her work is extremely valuable. She comes to know more about the individual pupil than any other teacher in the building if she is sympathetic and tactful. She acts as advocate and mediator and can secure the confidence of the boy and girl, without which no plan of guidance can be successful.

Up to the present, little has been said in this paper about vocational guidance being a function of the vocational counselor. This has not been because the counselor at Latimer does not carry any of the burden of guidance, but because his work is overshadowed, and augmented seventy fold by that of seventy-odd teachers on the high school faculty in the various ways that have been set forth thus far. The remainder of the paper will state briefly some of the duties which he assumes.

For administrative reasons not all of Latimer's pupils enter the school from the sixth grade. There are seven schools that promote from the eighth grade into the ninth. Consequently, each semester there are that many groups who need guidance in wise selection of courses. During the last two and a half years it has been the privilege of the couselor to make these visits. In previous semesters mimeographed material has been prepared to supplement the explanations he has made regarding the different types of work offered at the junior high school. This next semester he will be able to give these pupils a little booklet of twenty pages describing at greater length and in more detail than heretofore the general plan of organization of the school, descriptions of the various courses, paragraph "write-ups" of the many student activities and special features of the school, etc. It is planned to have the home-room teacher of these eighth-grade pupils take up this booklet with them in order to study carefully the difference between the several courses, both in subjects offered and in the occupations to which they lead. Such study, after the general discussion of the advantages of going on to high school which the counselor will give at his first visit, will prepare the way for the individual conferences of his second visit a week or ten days later. At that time the pupil's school record, the teachers' estimates of ability, the results of intelligence tests and achievement tests will all be checked against his choice of course. If his choice seems unwise an effort will of course be made to aid in making a different choice. This kind of educational guidance has proved itself valuable in the past in preventing requests for change in course after the beginning of the semester's work. The delays and loss of time which always accompany any such changes may well be avoided by intelligent advice and the pupil is saved the more or less harmful effects which are usually the result of having started something that he couldn't finish.

The group and individual conferences which are indicated under part VI of the outline are not essentially different in kind from those of part V. Practically the only difference lies in the fact that the former are "intra-mural," while the later are "extra-mural." The pupils who enter the school out of the sixth grade select one of the four courses at the close of the seventh grade. It is just as important for these pupils to make careful choices as for those who enter from the eighth grade. In the case of these 7A pupils, however, the counselor has the help and advice of the report teacher who has been able to learn many valuable details about the members of her class in her Tuesday conferences. It is planned to make use of the little booklet, the handbook of information, mentioned above, in much the same way as with the eighth grade students. Four or five Tuesday conferences will be based on the material in the "handbook."

Group and individual conferences are also held with 9A students to assist in making wise choice of electives in the senior high school, and to discover in time those students who are thinking of dropping out of school at the close of their junior high school work.

In addition to these conferences, the counselor meets all truant cases, failing pupils, those who are delinquent and all others who are potential drop-outs. He also meets all those pupils who wish to leave school to go to work, and has conferences with both pupils and parents before any preliminary papers are granted.

In conclusion one may perhaps be permitted to call attention to one outstanding fact in the program which has been set forth in this paper, viz: that the work of the vocational counselor himself is only a small part of all the vocational and educational guidance program of the school. He personally could not begin to do all of the things which have been here enumerated.

Even though he does not have a teaching schedule, yet much of his time is taken up by matters of the regular school administration inasmuch as he is also serving as Head Teacher of the school. The important thing is that so many of the activities of the school have been organized on the basis of guidance. In social science, in shop work, in English, in the very classification of the students this principle is operating and thus the limited efforts of a single counselor are multiplied a hundred fold. And it will only be through a broad and comprehensive program of this kind that we shall ever be able to give effective and worth-while guidance.

To summarize: The vocational and educational guidance program of the Latimer Junior High School includes:

I Classification of Pupils.
13 Classes of 7th grade pupils classified on basis of I. Q.
3 Classes of 9A Academic pupils classified on basis of I. Q. in Mathematics, English and Foreign Language.
4 Classes of 8th Grade Academic pupils classified on same basis.

II Try-out Courses:
General Shop, offering 6 kinds of shop work to 7th grade boys.
Courses in 8th Grade developed on try-out basis. Shop Work in Technical course organized on "Rotation Plan" to give try-out experience.

III Vocational Information Classes.
2 Classes (75 pupils) Academic 9th grade, elective.
All Classes 9th Grade Commercial Students.
All Classes 9th Grade Technical Students.
All Classes 9th Grade Vocational Students.

IV Report Teachers' Conferences.
Tuesday Activities Period set aside each week for group and individual conference of report teacher with her report class. (At this time she can take up progress of group as a whole or of individuals in her class, can draw out educational and vocational plans of the pupils, etc.

V Visitation of Elementary Schools by Counselor for Conference.
Each school promoting 8A pupils is visited twice; once for a group conference and the second time for individual conferences regarding choice of courses.

VI Vocational Counselor's Conferences.
Conferences with 9A pupils reparding future educational or vocational plans.
Conferences with 7A pupils, (group and individual) regarding choice of 8th grade courses.
Conferences with truant, failing or delinquent pupils.
Conferences with prospective drop-outs and parents.

Reproducing Antique Furniture in the School

Herman Hjorth, Director of Technical Work, San Juan, Porto Rico

MIRRORS.

WITH the exception of nature's mirror, a pool of still water, the first mirrors of which we have any record were used by the ancient Jews and consisted merely of a polished plate of brass. The Egyptians, Greeks and Romans used similar mirrors, but made of bronze, of which many specimens have been found and preserved in the collections of museums.

Mirrors of glass were not made until the year 1300. They were first made in Venice and were generally small, as it was difficult to make large panes of glass at that time. They were backed with sheets of tinfoil over which quicksilver was poured. The quicksilver formed an amalgam with the tin, which adhered to the glass. This method, however, was very unhealthy for the workers in the industry, as well as mechanically imperfect, inasmuch as mirrors backed by this process only reflected less than half the rays of light.

Mirrors were consequently so expensive, especially in England and other parts of Europe equally remote from Venice, that only the very wealthy could afford them. A mirror therefore came to be considered as an infallible sign of wealth, and as wealth evidently was paraded then even as it is now, it became the fashion to frame these small, poorly made mirrors in elaborately carved and gilded frames out of all proportion to the size and importance of the mirror. Some writers believe that this practice led to the poor taste in the framing of pictures, which has been more or less evident in all periods and unfortunately persisted until the present day.

FIG. 15.

Venice continued supreme in the monopoly of glass making until 1670, when the Duke of Buckingham established the first glass work in Lambeth, England. From then on mirrors became less expensive and consequently more common in spite of the indifference with which personal appearance was regarded in those days.

During the William and Mary period (1688-1702) mirrors were also used as a decoration on furniture, and were to that end set into the panels of doors, etc.

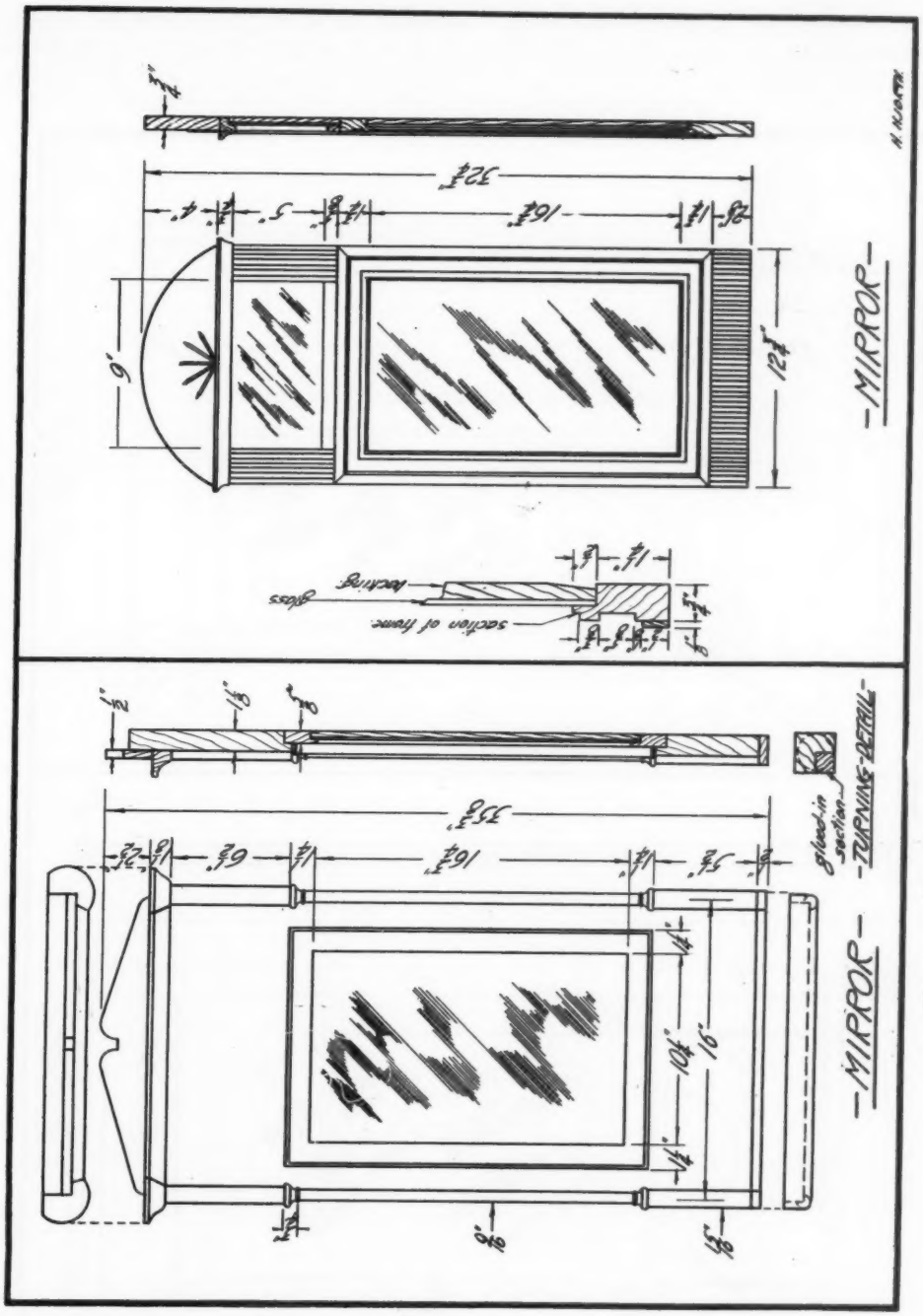


FIG. 16.

FIG. 15.

Chippendale (1740-1780) gave much attention to the design of mirror frames, which continued to be exceedingly elaborate until the influence of the Adam Brothers (1762-1795) made itself felt.

As a tax was placed on mirrors beyond a certain size, they were often made up of several smaller ones, so as to evade this obnoxious assessment. Sometimes one mirror pane overlapped another and sometimes the joints were covered with pilasters, carvings and other ornamentation. The glass was thin, sometimes plain and sometimes beveled. Beveling was a very difficult operation as it was done entirely by hand and had to follow the many intricate curves and breaks in the elaborate frames. Bevels on old mirrors will therefore be found to be slightly rounded in contrast to the machine made bevels on the modern mirror, which are sharp and give a prismatic effect.

In 1836 the first attempt was made to back mirrors with silver. The process, however, was not durable, but the way had been shown, so that in 1855 a process

for silverbacking mirrors was patented, which is substantially the same as the one used at the present day. This process is briefly as follows:

is then flowed on, the glass meanwhile being placed on a warm table as the heat helps to precipitate the silver. When dry, it is given a coat of shellac followed by one

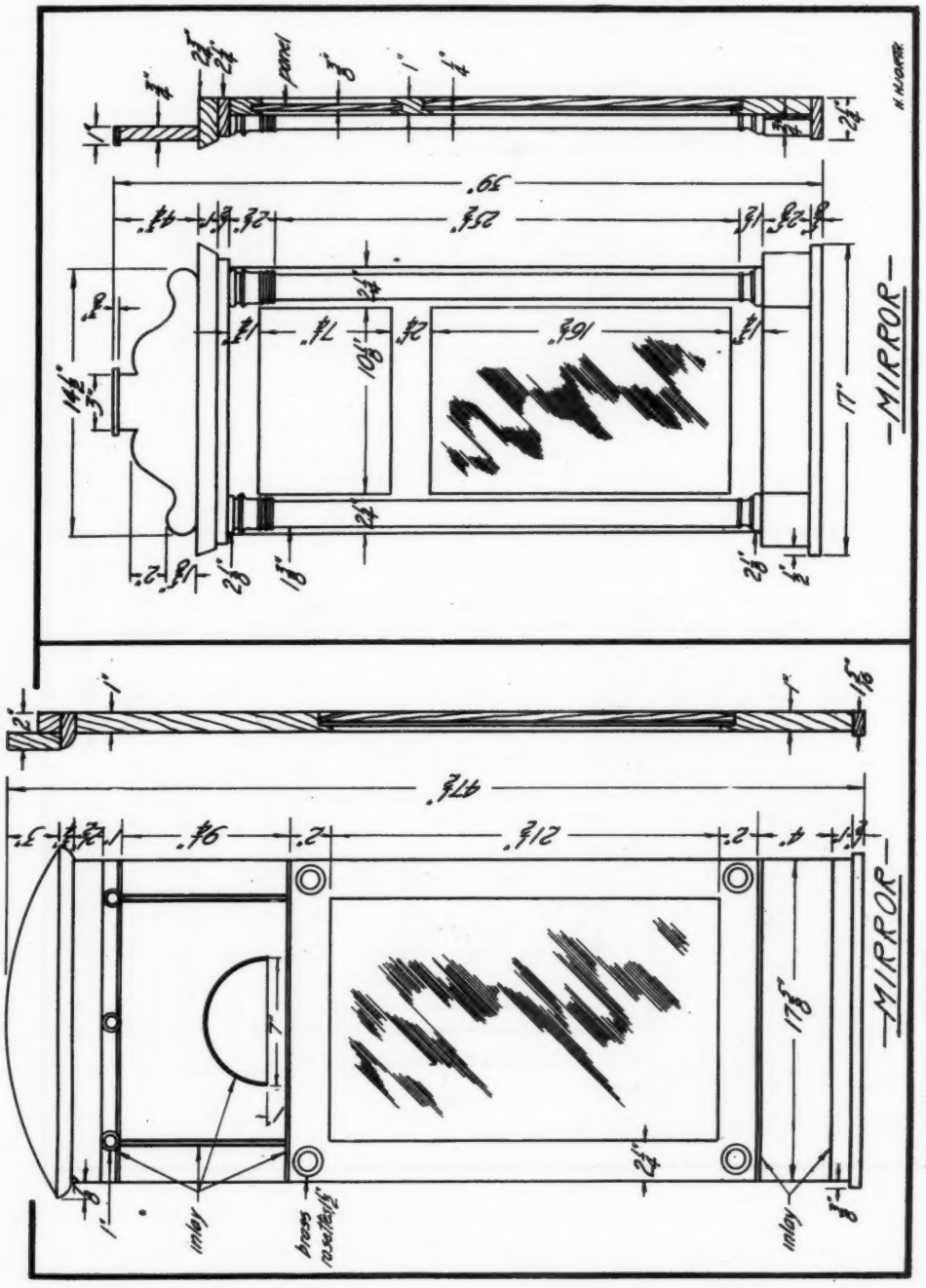


FIG. 17.

FIG. 18.

The plate glass to form the mirror is cut to size, polished and beveled if desired, all these operations being done by machinery. It is then inspected for imperfections and very carefully cleaned, distilled water often being used for this purpose. The backing solution, which consists of silver nitrate dissolved in ammonia with tartaric acid added to precipitate the silver

of paint. This process is much more efficient than the tinfoil and quicksilver process, as it reflects about 25 per cent more of the light rays.

While the term mirror at the present day is very broad, being used for all sorts and sizes, it is interesting to note that in America during the seventeenth and eighteenth centuries this term meant a circular glass

only. Other shapes were called "looking-glasses," "dressing-glasses," "pier-glasses," etc.

The mirrors described in this article are all of the Empire Period (1793-1830). Four of them, Figs. 15, 16, 17, and 18, are designed to hang on the wall and would be very appropriate over a commode. The structural details present no special difficulties as the frames are all very simple and joined with mortise and tenon joints.

Fig. 15 has two turned columns, of which a quarter section is cut out, so that they can be glued over the outer vertical corners of the frame. This quarter section is best cut out of the square stick before it is turned. Another piece of wood, for example, pine or poplar, is cut equal to the quarter section of the stick and glued to it instead of the one removed. When dry, the stick is turned, after which the glued-in section may easily be removed by means of steam from the glue heater. (See detail.)

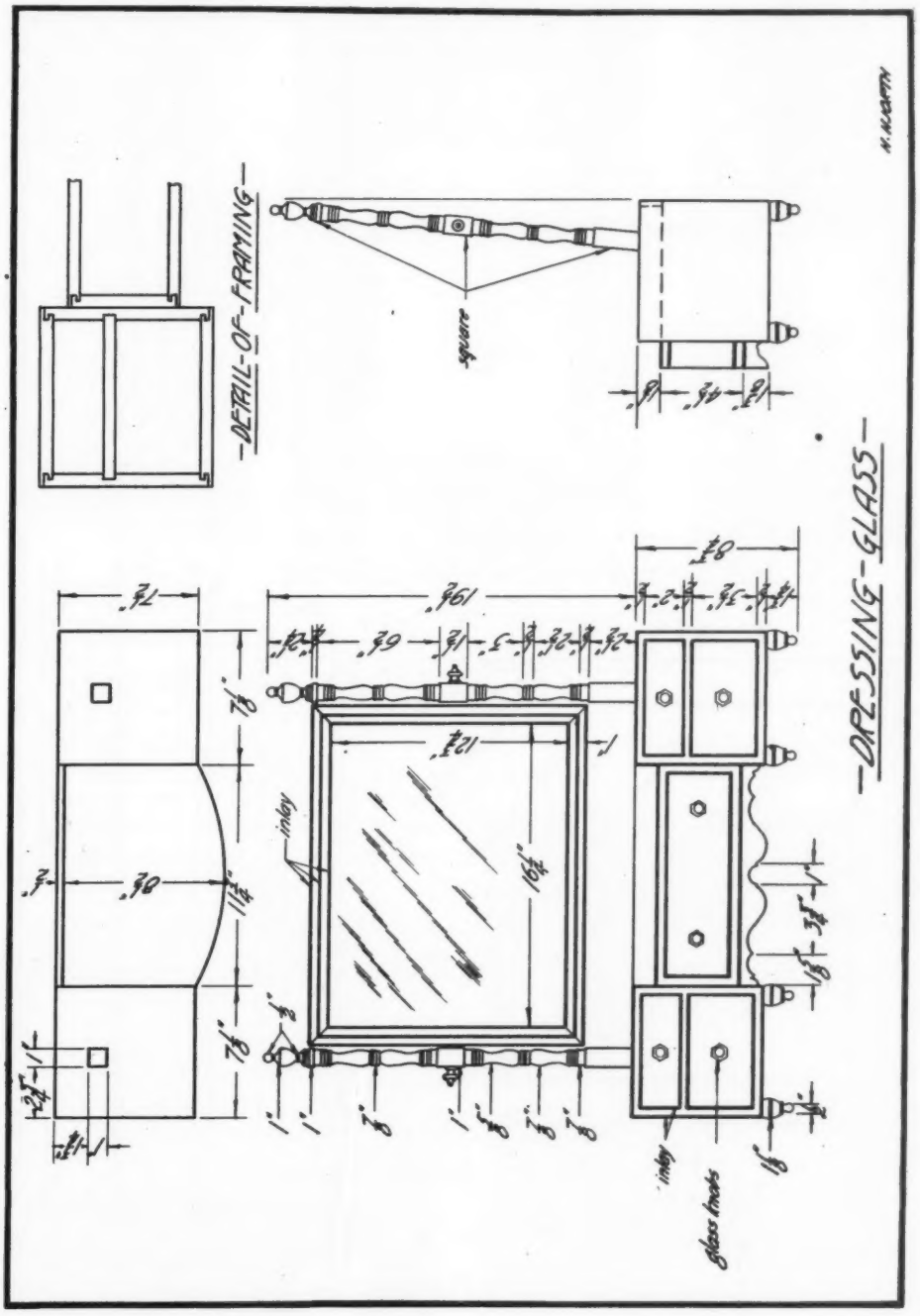


FIG. 19.

The recesses in the mirror frame, Fig. 16, may be cut on the circular saw before the frame is mortised together, after which the small sections of wood still remaining may be chiseled away by hand, so as to make the groove continuous. The outer edge, ½" wide by

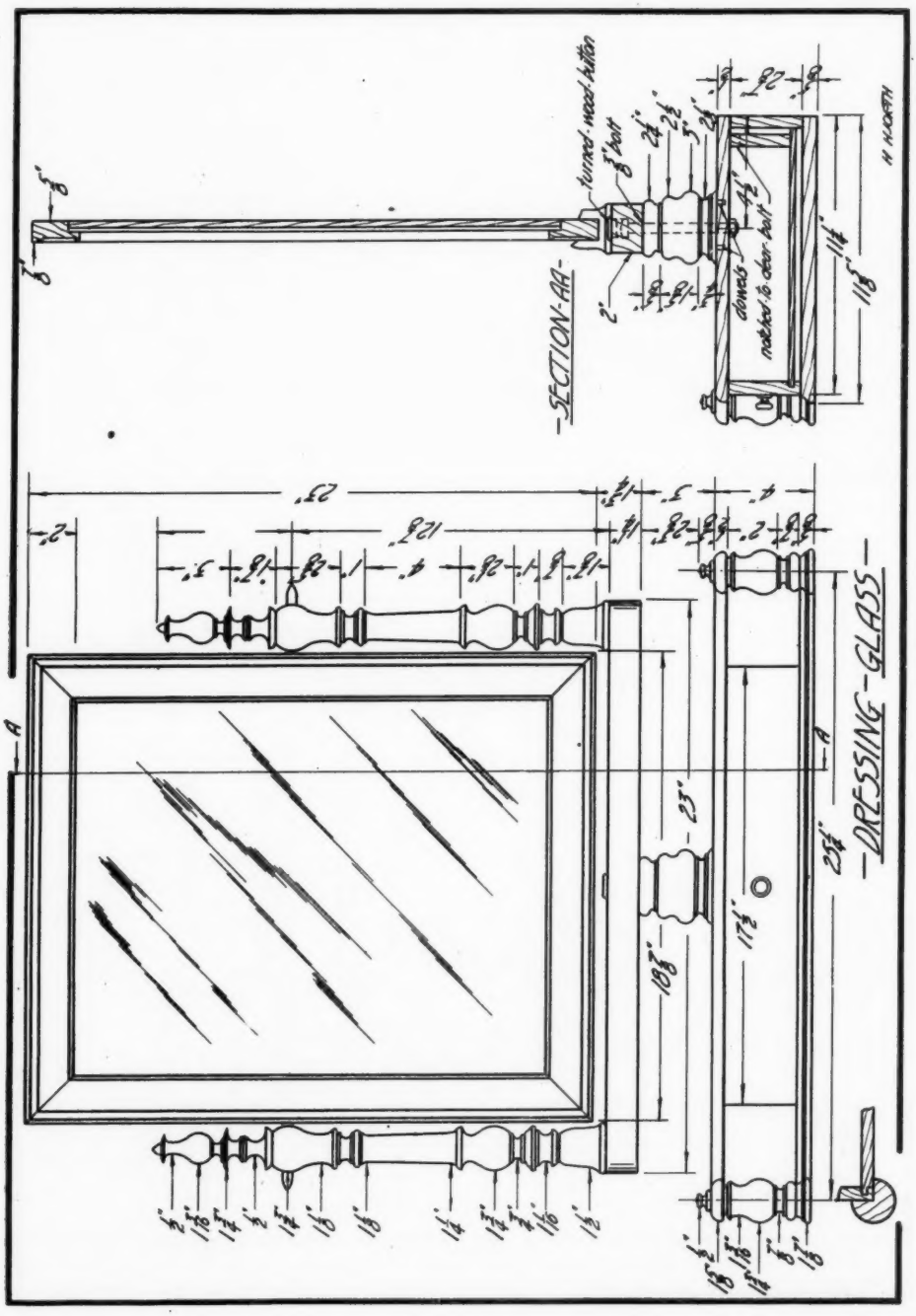


FIG. 20.

⅛" thick is better made separately, mitered and glued in place. The fluting may be done by hand with a small gouge.

The frame, Fig. 17, is so easy to make that no description is necessary. Suitable borders of inlay may be bought from the J. Bernard Co., 422-430 East 53rd Street, New York City, and brass ornaments can be obtained at P. E. Guerin, Inc., 21-25 Jane Street, New York City.

The half columns of the frame, Fig. 18, may be turned.

The Dressing-Glass, Fig. 19, is a small mirror swinging between two uprights fixed to a base having five drawers. The mirror can be tilted forwards or backwards as desired, and for that purpose several kinds

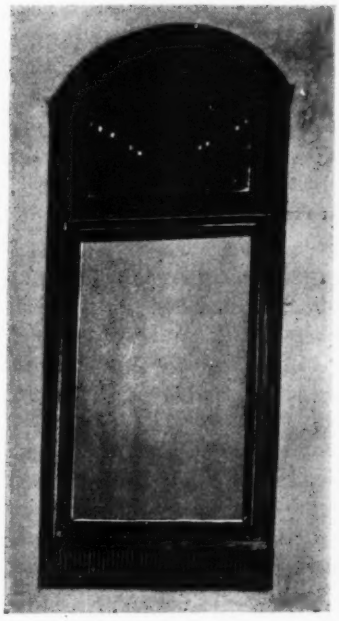


FIG. 16.

FIG. 17.

FIG. 18.

of friction hinges or looking-glass screws can be obtained on the market. The base, the framing of which is shown in detail, should be veneered, at least on the front, to hide the joining. The feet are shown as turned, but carved claw feet would have been more in harmony with the period. A dressing-glass, as this one, should be placed on top of a commode or chest of drawers. Such indeed was the custom in the middle of the eighteenth century, while in the beginning of the nineteenth century a mirror and a shallow tier of drawers were evolved from these dressing-glasses and added to the chests of drawers as an integral part of them.

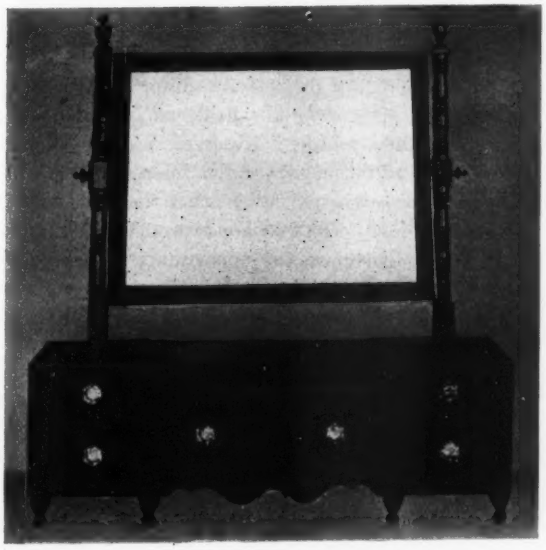


FIG. 19.

FIG. 20.

Fig. 20 is another type of dressing-glass. The mirror is hung in a frame, which in turn is fastened to the base by means of a bolt. This arrangement permits the mirror not only to tilt forwards and backwards, but also to be turned sideways. The small turned columns at the sides of the base have a quarter section cut out as described above (Fig. 15). This mirror may be made more elaborate by the addition of carving and side brackets for candles as shown in the photograph.

When framing a mirror it is advisable to put several layers of paper between the glass and the wooden back.

The Itinerant Teacher in Vocational Education

Prof. Edward S. Maclin, Professor of Industrial Education, West Virginia University

UNDER the leadership of the college of engineering of West Virginia University there has been developed a comprehensive and efficient plan for training miners for the more advanced positions in and around coal mines. The work is under the immediate supervision and direction of the department of mining engineering. One man who has been a mine foreman and who understands thoroughly all phases of mining work is attached to this department as assistant director of mine extension. It is his duty to prepare lessons supplementing Bulletins 38-42 of the Federal Board for Vocational Education and to send these out to the field men. At intervals he visits their classes to check their methods of instruction, the appropriateness of the work for that particular group, and how nearly it actually fits into the needs of the miners.

At present there are five centers in each of the following districts. Fairmont, Logan, Kanawha, Beckley, Mt. Hope, and Welch. There is a field man, who is an ex-miner, and who holds a certificate of competency as mine foreman in each district. It is his duty to organize the classes in the fall, to keep his classes recruited, and to meet it once a week. The schedule of the five centers of the Fairmont District is.

Mt. Clare—Monday night
Clarksburg—Tuesday night
Carolina—Wednesday night
Shinnston—Thursday night
Fairmont—Friday night

It is proposed to provide a two-year program for each district as follows:

FIRST YEAR

Mine Gases	6 Lessons
Safety Lamps	6 Lessons
Ventilation	12 Lessons
Timbering	10 Lessons

SECOND YEAR

Explosives	6 Lessons
Haulage	8 Lessons
Drainage and Pumping	6 Lessons
Mine Fires and Explosions or Electricity in Mines	6 Lessons
Methods of Working	8 Lessons

The enrollment this year is 775. Each meeting of the class is for an hour and a half. Frequently the class has lasted two hours or longer, due to the interest of the students. From the type of organization, it is apparent that a man may register for just such courses as he may feel the need of. It is the constant duty of the district teacher to keep his class filled by bringing in new students as he changes from one division of his course to another.

This field of work is carried on at a cost of approximately forty cents a man for each hour of class instruction, and is paid by the State which receives reimbursement from the Smith-Hughes fund for not exceeding one-half of the salaries of the instructors. The cost compares favorably with other technical courses given under public supervision and control. As the work becomes better established and its importance more keenly felt, the cost will be materially reduced. The basis of pay of the instructors is to some extent fixed by the amounts they can earn as mine foreman and it is needless to say that they are hand picked because they are known to have the mining experience and knack for putting over the work, two elements so necessary in instruction of this kind. The men receive actual traveling expenses incurred in the discharge of their duties, in addition to their yearly salary which is paid on a twelve months' basis.

The assistant director of mine extension is classed as an itinerant teacher trainer and as such the state is reimbursed for one-half of his salary from the Smith-Hughes teacher training fund.

Each summer a six weeks' mining short course is held at the University. The field men are used as instructors in these schools. Miners come from all parts of the state and take a very active interest in the work. Its popularity is attested by the fact that 106 enrolled last summer and fully 200 are expected this summer. At the close they have the opportunity of taking the mine foreman examination. This course is conducted as a part-time dull season school and meets all the requirements of the Smith-Hughes Law for this type of education.

The above description of the plan of the mining department of the West Virginia University to give the man on the job the kind of education he needs is given to emphasize the possibilities of the itinerant teacher. It is clearly impossible to have an expert, well trained teacher in every mining camp or cotton mill, or machine

shop, or industrial center, or enterprise, but it is possible for some central agency, the state board of education or the engineering college of the state university, or two or more industrial communities to carry on this type of educational activity. In too many cases the local school authorities do not have a vision of this kind of work and they do not have a properly qualified instructor. Some local journeyman who works all day does not have the time to work up his classes or to properly prepare his class material even if he knew how.

Too many of our schoolmen have not learned that night schools are made by going after students and then keeping after them. These students must receive instruction tonight that they can take back into the shop and use tomorrow. Of course, some of our communities claim that they do not have funds to invest in such courses, which is a polite way of saying that they are not in the least interested in your project.

Such a plan as outlined above is feasible in conducting non-vocational day school work in agriculture, home economics, manual training, science, and other subjects. It means that two or more communities will agree to employ John Doe for a certain sum to do a certain piece of work, said J. Doe to give his work at school A daily from 9 to 11:30 A. M., and at school B from 1:30 to 4:00 P. M. If more than two schools are concerned, it will be necessary to have a definite program, either so much time each day at each school, or a certain time on certain days at specified schools. This should be a written agreement signed by all parties directly concerned, so that there will be no misunderstanding. In this way each school gets the benefit of a person trained to teach his subject and at the same time does not have to have him idle part of the day or teaching subjects for which he has no training or aptitude. As has been shown above, it is very well adapted to night schools and it will work equally well in all-day and part-time schools.

Another very significant thing in this West Virginia plan is that of the part-time dull-season classes held during the summer. While many of our industries may not have a pronounced dull season, as a general thing there is a period of let down when it is possible for men and women to come to some central point for a period of definite, constructive, vocational instruction which would comply in every way with the requirements of the Smith-Hughes Act and send these people back into industry better workmen and leaders. If a sufficient number can be secured in a community and the necessary equipment is there, it is just as good to hold the session there as to bring all of these people to some other central point as the State University.

An Industrial Course in a Small High School

Jas. R. Coxen, Cheyenne, Wyo.

IN CONSIDERING the establishment of an industrial course in any community, one of the first points to determine is the local need for new workers in that industry. A school should always consider the needs of its community and there seems to be but little excuse for training young people for occupations in which there are few local opportunities. For that reason an industrial course to prepare for a single occupation is seldom found in the high school of a small town. Indeed, it is seldom that there is any need in such places for unit-trade courses. This fact was recognized when the Federal Vocational Education Act was passed and special provisions were made for the establishment of general industrial courses in cities having a population of less than 25,000. There are, however, a few places in the country where the local industrial conditions are such that training for a single occupation is justified as a part of the high school work. Such a condition exists at Rock Springs, Wyoming, where a course is maintained to prepare high school pupils for duty as electricians in the coal mines.

Rock Springs is a town of about 8,000 people and practically the only occupation in that section is mining. Seven coal companies, with headquarters at Rock Springs, operate more than 30 mines within a radius of 35 miles. At each mine there is much electrical equipment and more than 300 men are needed to operate and maintain it. Only a few of these men have been trained for their work and as a result the equipment must be frequently repaired or replaced. New mines are being opened and more electrical equipment is being constantly introduced, so the mine operators felt that there would be no difficulty in using the 20 or 30 new workers which the schools might train each year. They felt the need for properly trained workers but had no plans for training them. After a study of the situation, the school authorities decided to establish a mine-electrical course.

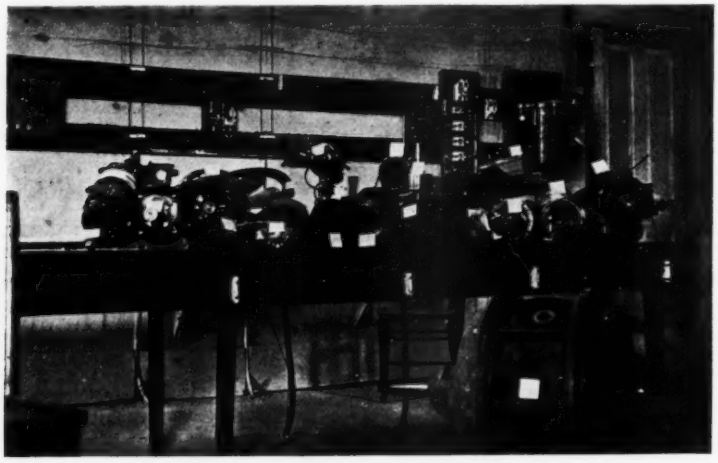
The course was started in the fall of 1919 and is now operating for the third year. The high school has an enrollment of about 250 pupils, representing a score or more different nationalities. At present 35 boys are taking the electrical course and there is a list of almost that number who have applied for that work for next year. To enter the work a pupil must be at least 15 years of age, for the mines will not employ workers below the age of 17. Pupils are also supposed to have finished one year of high school work, but this requirement is sometimes waived in the case of mature pupils. Two years of work are now offered but a third year will be added next fall. Throughout the course one-half of the school day is given over to the shopwork. Related and academic subjects are given during the

REPAIRING INDUCTION MOTOR.
Student in mine electrical course.

other half day. During the first year the shop practice is principally machine and forge work with some attention given to simple electrical wiring. The related work consists of mechanical drawing, including electrical wiring diagrams, mathematics and a study of applied science. The shopwork of the second year includes electric wiring—cleat, knob and tube, and conduit systems—use of direct current machinery, storage battery work and machine repairing. Related subject work includes a study of the Underwriter's Code, the drawing of plans and making of estimates for electrical installations, and a study of direct current machines. The third year will be devoted to alternating current work.

No attempt is made to train boys as engineers. They are being trained, however, for the kind of work found in the mines of that section of the state. A mine electrician is more than the name indicates—he must look after all equipment which is electrically operated—so much attention is given by the school to general repair work. At first the mining companies were doubtful about trusting their machines to students, but now more work is offered than the students can possibly do. A job completed by one class was the wiring and installation of all fixtures for ten four-room houses at one mining camp. Armatures of practically every type have been re-wound and all kinds of field and transformer coils have been replaced. A good deal of ingenuity is sometimes needed to wind coils of the required type, but successful results are practically always secured. The pupils have built a three-panel switchboard, have placed all shafting and machines and installed all of the wiring in the school shops. The school equipment also includes a number of machines which had been discarded by the mining companies but which have been rebuilt by the students.

The mine operators of Rock Springs have been very much interested in the development of this work and have given much help in organizing the course. They have also been very willing to employ the students during the summer months. The pupils who completed



SOME OF THE SMALLER REPAIR JOBS SENT IN TO STUDENTS IN MINE-ELECTRICAL COURSE, ROCK SPRINGS, WYO.

REWINDING ARMATURE FOR 3 HP. MOTOR.
Student in Mine-Electrical High School, Rock Springs, Wyo.

the two years' course last June had no difficulty in securing jobs and reports from their employers indicate that they are "making good."

In making plans for the work the school authorities realized that the success of the course would depend largely on the kind of teachers who were secured. In considering candidates they insisted that each must qualify on three points: technical training, practical experience, and training for teaching. Two men are now employed for this work. Both have had university training, both hold union cards, and both have taken special teacher-training work. In planning the course of study an analysis was made of the duties of a mine electrician, and the school tries to prepare a boy for those duties. The work is organized on the unit basis, and the jobs in each unit are taken up in the order of learning difficulty. The related subjects work is outlined in connection with the various units so that it is really related to the work given in the shop. The following is an example of the method used in the organization of one unit of electrical work:

UNIT 1—LOW VOLTAGE WIRING

Shop Wiring Jobs

1. Simple bell circuit.
2. Two push buttons to ring one bell.
3. One push button to ring two bells.
4. Two push buttons to ring two bells.
5. Two or more push buttons to ring two or more bells.
6. Three wire return call system.
7. Bell system for two-family house.
8. Bells to ring separately from one button using multiple point battery switches.
9. Electric door opener.
10. Automatic drop signals.
11. Return call system using three push buttons.
12. Return call system using three-point switch.
13. Three-point mechanical reset annunciator.
14. Annunciator system with extension bell circuit.
15. Bell system with provision for ringing separately or simultaneously.
16. Fire alarm systems.
17. Electric hoist signal system.
18. Closed circuit burglar alarm system.
19. Railway crossing signal.
20. Changing vibrating bell to single stroke bell.
21. Thermostat system.
22. Door trip system.

Related Science

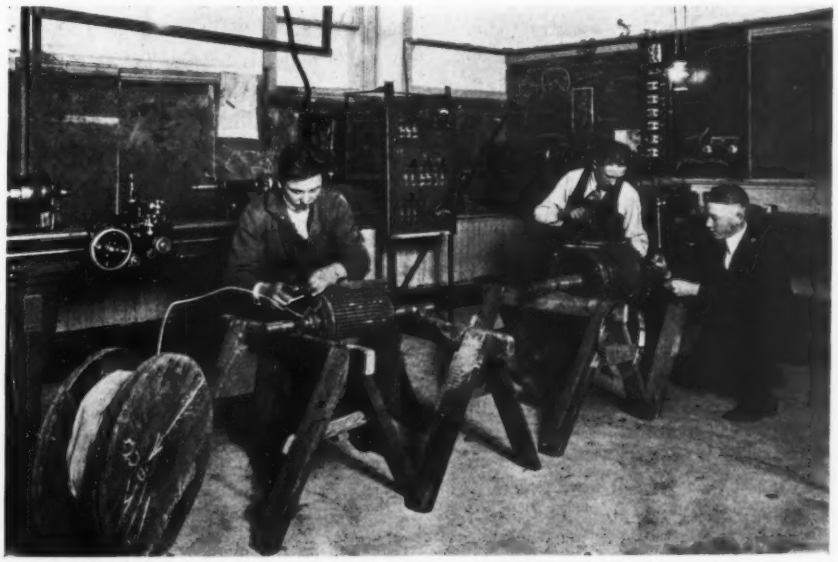
Cells and batteries.
Flow of electric currents.
Parallel and series arrangement of cells.
Magnetism.
Construction and operation of bells and signal systems.
Operation of thermostats.

Mathematics

Ohm's law.
Cost of bells and signal Equipment.

Drawing

Electrical symbols.
Wiring diagrams for low voltage circuits.
Wiring plans of low voltage electrical equipment.



STUDENTS DOING REPAIR WORK.
Mine-Electrical Course, High School, Rock Springs, Wyo.

Reclaiming Old Magazines

Jane Littell

WHERE is there a person who has not wondered, when passing a magazine stand loaded with several hundred current magazines, or when sorting the old magazines out of the pile on the library table, what becomes of all these printed pages after the hasty reading given them?

A small percentage of paper goes into furnaces and is destroyed, but by far the greater amount is collected by the men who drive down the alleys with their cry of "Any rags? Any papers today?" These men fill their wagons, and then take their collections of paper to junk yards, where the paper is carefully sorted into grades, and baled to be sold to the paper mills. Surprising as it may seem, there are a number of grades of this waste paper. For instance, all magazines, old books, letters, ledger paper, posters and pamphlets, are baled together to be made into new magazine paper. The heavy, strong grades of wrapping papers which were made of jute fibers are baled together and sold to the mills making pasteboard, and are made into a strong and flexible product known as jute board, which in turn is used to make a certain high grade of boxes. Old newspapers and broken boxes go to the board mills, too, but this grade of waste paper makes the quality of board that is covered with glazed paper and used for shoe boxes.

The process of reclaiming magazine paper is the most interesting, probably, because this paper is remade into the same grade of paper. The other two just mentioned step down a notch in quality when they are made over.

Magazine paper, of course, is of many grades, but 95 per cent of the paper used in this country today is made all or in part from wood. There are two processes used to prepare wood for paper. One kind of wood pulp may be used for making high grade magazine paper,—it is called soda pulp. The other, which is used in making newsprint, is called ground wood. If any ground wood fibers were present in paper made from reclaimed magazines, these fibers would have turned yellow from the reclamation process. Therefore, all paper containing ground wood is carefully sorted out when the magazines are baled to be sold to the mill which is to reclaim them.

When the bales of old magazines reach the paper mill, they are broken open and sorted hastily to remove any newspapers or any paper containing ground wood. The bales are opened near a conveyor belt six or more feet wide, and the magazines tossed onto the moving belt, which carries them up at an angle of 45 degrees to huge machines on the floor above, called shredders. There are steps built along the sides of the conveyor belt, and on each step is a girl, called a sorter, perched upon a stool. As the magazines slide past on the conveyor belt, each girl watches carefully to see that no paper goes past her that should not go into the making of new paper. The girls turn the magazines over—almost carelessly, it seems to the onlooker—and snatch out of the mass an inoffensive looking magazine that seems no different to the uninitiated than the rest of the papers. These girls get to be expert in detecting paper which contains ground wood. They also know the names of every magazine of any consequence published in this country and Canada, and whether or not each contains the forbidden ground wood. They can tell the name of a magazine, generally, from the make up and size, even if the cover is missing and they do not see the name. Old letters, books from which the board covers have been removed, pamphlets, all get the same thorough inspection.

The conveyor belt feeds the magazines and other papers into a machine called a shredder, which tears them apart, and does just what its name implies—shreds them into fairly small pieces.

From the shredder, the torn papers are fed into another machine, called a duster, where they are shaken until all dust, clips that hold the magazines together, and all foreign matter are shaken out of the paper.

From the dusters, the papers go into huge concrete tanks, called pulpers, which hold approximately two thousand pounds of paper each. In these tanks, the papers are soaked, and cooked with five per cent of dry soda ash, according to the weight of the paper. Water is run into the soaking tanks with the papers, and heated to approximately 200 degrees Fahrenheit, and the mass is constantly agitated for about an hour. This process loosens the ink and partially disintegrates the paper.

The paper is by now a soft, partially disintegrated pulp, and is dropped from the soaking tanks through large pipes to other tanks immediately beneath on the floor below, where by means of violent circulation and a powerful pump, the fibers of the paper are completely separated.

From this second set of tanks, the pulp is pumped over screens where any pieces of paper that have not been completely defibered are screened out, and only the perfectly prepared fibers are pumped to huge tubs called washers. The washing process is a highly technical operation, which consists of pressing out some of the water—this first squeezing takes most of the ink with the water—and then thinning it again. This is done three times, and the paper fibers are nearly clean at the end of the third washing.

Next the liquid mass goes to the bleaching tanks, where it is bleached with chloride of lime to a snowy whiteness. Then it is given a final washing to carry away the bleach, and is ready to be mixed with other pulp and made into paper. At this stage it is called

finished old paper stock. In making the new sheet of magazine paper, over half the material used is this old paper stock. The rest is a pulp made from cooking wood chips with a soda solution,—a very different process from the one used to make the ground wood which is so carefully eliminated by the sorters.

The soda pulp which is to be mixed with the old paper stock is prepared in a tub called a beating engine, with the amount of alum and size which the kind of paper calls for. After being diluted with water and beaten to the proper consistency, it is dropped from the beating engine, simultaneously with the prepared old paper stock, into a huge cistern beneath the floor. In this cistern the mass is stirred or agitated continuously until it is needed by the paper machine, when it is pumped to what is called the stuff chest at the wet end of the paper machine, and from there onto the machine where the sheet is formed.

The stock, which by now looks like milk, flows over a screen made of brass wire or plates with 1/32" openings. This catches any wadded up material. Then the stock goes over an apron onto a closely woven endless wire where the sheet is formed. This wire is shaken from side to side in order to knit the fibers together, and they are very closely interlaced before they reach what is known as the Couch roll, where the sheet gets the first squeeze. Next the paper goes between press rolls, where some of the water is pressed out. A suction system takes some of the water, some of it has already gone through the screen on which the sheet was formed, and the driers, which are hollow cylinders heated with steam, extract the rest of the water.

The paper is now an endless sheet, all ready to go to the calenders to be finished. The calenders are stacks of rolls which perform the same office for the newly made paper that a flat iron does for newly laundered clothes. From the calenders, the paper is rewound for shipment to the magazine publishers, more magazines will be printed, and these same magazines may find their way back to the paper mill, to become part of the endless chain formed by the reclamation process.

Developing an Industrial Education Scheme at Columbus, Indiana

A. E. Logan, Director of Industrial Arts

I. Location and Condition.

COLUMBUS is a town having approximately 9,000 population—the greater number of which are interested in industrial pursuits—machinists, carpenters, and cabinet-makers being the chief tradesmen. However, the town lies in the heart of a rich farming territory which lies along White River and about two-fifths of the 600 high school students come from the rural community, thus creating a complex industrial problem.

Industrial work was installed twelve years ago in a dark, damp basement room of the high school, large enough for twenty benches, at that time a place considered quite adequate for work of this nature. Woodwork and drawing were introduced and soon the new activity became so popular that the students could not be accommodated. At the close of each year a large exhibition of the work constructed in the shop was offered to the public as a means of proving what could be done and of advancing public sentiment in favor of manual arts.

After several years of publicity and growth, the school officials decided the opportune time had arrived for the construction of the new factory-type building we now have. The separate building is a vast improvement over a department in the regular high school.

II. Construction of Building.

The tentative plans were drawn by high school boys and were turned over to the architect, who completed the job with some changes. The structure consisted of three floors, 60'x100', located on the same block as the main building and easily accessible to it.

I may add that several prospective factory builders have visited this plant and studied the construction, which is practically fireproof, having outside walls constructed of hard brick adorned with a terra cotta cornice and inside walls of metal lath and plaster. The foundation, floors, stairways, columns and girders are concrete, well reinforced; the window frames are metal and only the doors are wood.

The building is durable, maintenance is cheap, there is plenty of room and abundance of light, as may be seen from the photograph. The entire weight of the structure is supported by columns and girders, which is a great convenience, as partitions can be located as desired or can be moved if conditions warrant a different plan.

A freight elevator was installed to take care of all heavy material, a fan for ventilation, and sinks and drinking fountains in all rooms. The first floor is excavated only three and one-half feet, so is lighted as well as the others and is perfectly dry. All doors leading from all shops are double width for easily handling materials and projects.

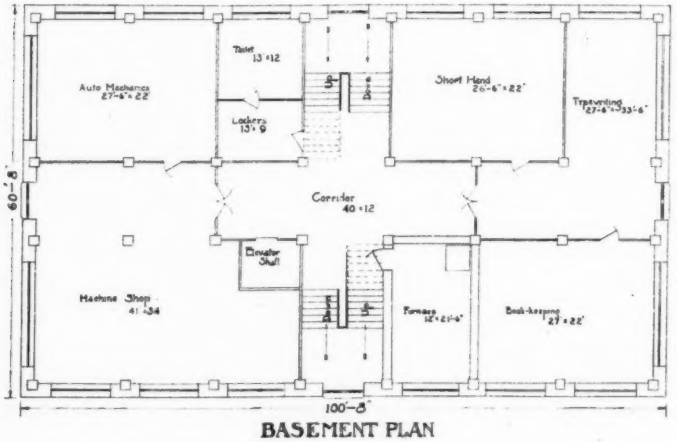
III. Floor Plans.

All vocational activities are conducted in this plant—commercial, agricultural, physics and radio, and industrial—the last utilizing half the space. On the first floor three rooms are fitted for typewriting, bookkeeping, and shorthand, respectively. A narrow corridor

VOCATIONAL BUILDING OF THE HIGH SCHOOL, COLUMBUS, IND.

extending through the width of the building separates the machine shop and a spare room for automobile mechanics.

The machine shop is equipped with four lathes with milling attachments, two drill presses, a hack saw, a forge and anvil, a grinder, eight bench vises and a fine assortment of tools. All machines are driven by one large motor with proper shafts and belting, the entire outfit having been installed by students.



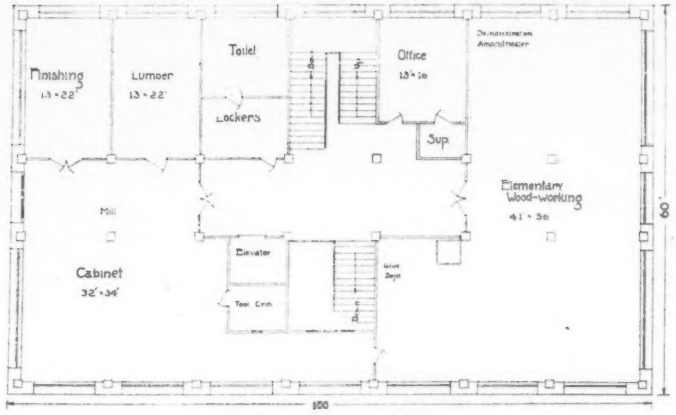
BASEMENT PLAN

Each floor is provided with a toilet and locker-room, the latter being of special use in changing and caring for clothes.

The entire second floor is occupied by the wood-working department, which consists of a demonstration amphitheater, a glue department equipped with both gas and electrical heating apparatus, two shops so located that a common tool room is accessible for both, a mill department containing a variety saw, mortiser, tool grinder, lathe and jointer. Adjoining this division on one side is a lumber room provided with suitable racks, which can be easily converted into a kiln, and on the other side is the finishing room in which a stain table, drying rack and a large case for stain materials have been built. This is a fine place for finishing. Most of the dust is eliminated, the atmosphere can be modified and the light can be regulated.

An office 14'x20' and a supply room 8'x10' are connected with one shop and both are very essential in an industrial department. The supply room is fitted with proper shelving and pigeon-holes, providing a means of caring for supplies systematically and of keeping repair tools in stock.

ADVANCED DRAFTING CLASS, COLUMBUS, IND.



FIRST FLOOR

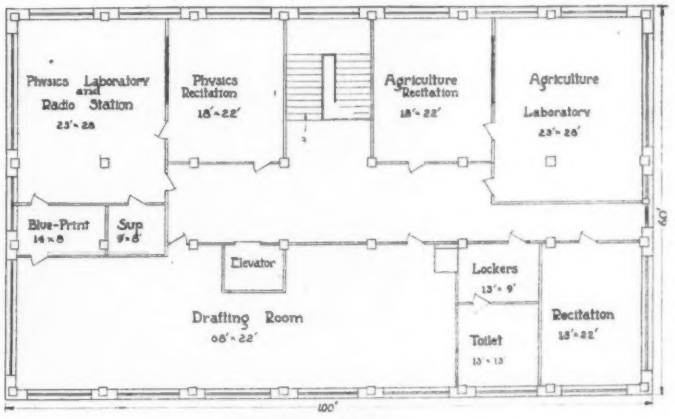
To my mind the office is a necessary adjunct, for it is here all records are filed, all cost bills and courses of study are kept, and a large bookcase containing a number of models, catalogs, and bulletins is maintained. Catalogue systems for listing blueprints and industrial reference books are recorded in filing cabinet also. All of these aids tend toward expediency, organization, and efficiency. A medicine cabinet containing a first-aid outfit is also located in the office, a necessity no shop can afford to omit.

The shops are supplied with benches, lockers, cases and tools for 45 boys, all constructed in the shop. A checking system for the tool room has been devised to meet our situation and each period a boy is assigned to this duty.

On the third floor the physics and radio department occupy three rooms—a recitation room, separated from the spacious laboratory by a partial glass partition, and a roomy supply closet off the laboratory. Across the hall are three similar rooms devoted to vocational agriculture. The north side of this floor is mostly taken up by the drafting department, which is 25'x75', with a blue-print and supply room off the corner. As the splendid north light pours in, it is seldom necessary to use artificial light even on the darkest day. The room is so arranged and equipped that two classes can be conducted in it easily when needed.

IV. Courses.

All school industrial activity of the city is located in this building centrally



SECOND FLOOR

located—grade, continuation, high school and night school. The grade work is required and the high school is elective. Cardboard construction and elementary mechanical drawing from models are given to the sixth and first half of the seventh year boys one hour weekly —the required tools being a rule and pencil.

Our courses are planned on the theory that an understanding of drawing is basic for all shop courses and we find that results justify this, and it is often surprising to note creditable progress even as low as the sixth grade. Eighty minutes per day are given the 7A's.

Other plans have been tried, but we find more can be accomplished by giving the work more consecutively than by spreading the same amount of time over a much longer period. Besides, it makes less preparation for the teacher; he has a smaller number of students to handle, which gives him opportunity to get in closer personal touch with each. A better academic program can be planned without conflict. The pupil receives instruction in both drawing and woodwork now, the drawing being chiefly of shop problems.

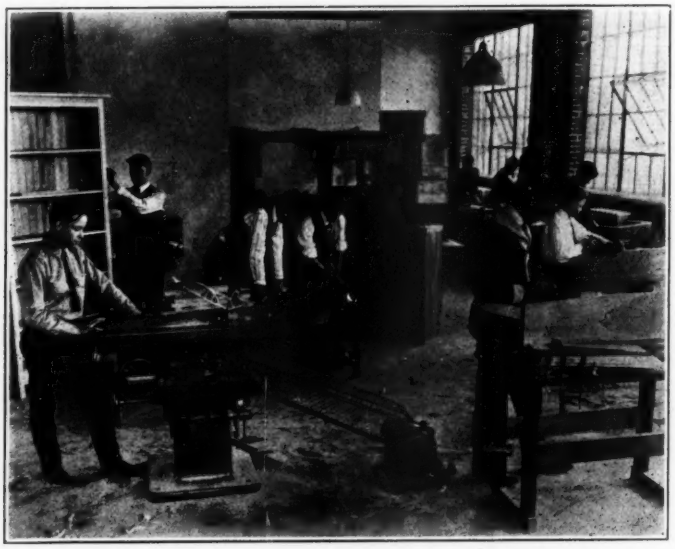
In all courses one period per week is set aside for instruction on subject matter not very closely related to shop, e. g., a study of industries, trees, factories, etc. For this reference work a library of two or three hundred volumes has gradually been accumulated—an invaluable asset to such a departmbent, as a much broader view of industrial development and activity can be given.

With this purpose in mind, the 8A work is planned with as much differentiation as seems adaptable to our situation, for many experiences will tend to help the boy locate himself vocationally. The types of work outlined and given in units of unequal length are as follows: drawing, woodwork, upholstery, caning, concrete, soldering, home repair, demonstration of all shop machines to class, and visiting factories. It frequently happens that time does not permit the student to make a project of each activity, but he at least has opportunity to observe and receive instruction.

When the pupil enters high school, he may elect one of three courses or take some of all—drafting, woodwork or machine shop. If he selects cabinet work, he is required to take drawing two days a week for the first year. He chooses his own cabinet project, designs it, figures lumber and cost bills and keeps a time card.

The problems made are the usual ones—cedar chests, piano benches, chairs, tables, writing desks, music cabinets, etc., and as some problems require less time than others and pupils differ in ability, a flexible point system has been devised from the average and each project carries a number of points and a definite number is required for the completion of the course. The pupil should be held to his maximum ability and not his minimum.

However, those individuals entering high school from the rural community and who intend to remain there after finishing their course, are given agricultural drafting and farm mechanics. The 95 who remain at home should be taken care of as well as the five who go to college, and as the community determines the type of work given, the following course has been formed: projects for the farm shop, poultry, yard, concrete forms, barn, house, farm maps. Later they go into the shop and construct one of each group so far as practical, and in some cases models are made. Occasionally credit is given for home project work done under super-



FRESHMAN CLASS IN CABINET CONSTRUCTION, HIGH SCHOOL, COLUMBUS, IND.

CORNER OF MACHINE SHOP, COLUMBUS, IND.

vision. This makes the work very practical, as the boy has his own native environment and outfit of tools.

The second year of cabinet work for urban boys is principally mill work, half-time given to individual pieces and the remainder to school needs. By this plan all typewriting desks, library cases, tables, lockers, etc., can be made easily with much value to the student as well as the school. Several hundred dollars each year are saved to the schools.

At present two semesters are given to machine shop practice, and it will soon be necessary to add more. Practical problems are made—wrenches, clamps, screw-drivers, grinders, and pliers.

A four-year course is arranged in drawing and drafting, given in this order if all is desired: projection, working drawing, intersection and sheet metal, isometric, cabinet projection, freehand sketching, both orthographic and perspective, furniture design and mechanical perspective.

This covers about two years. Then the student may choose architecture or machine drafting. Machine drafting consists of kinematics, shop mathematics and elementary design in addition to regular machine work. A portion of the course is taken from machines or machine parts as valves, carburetors and lathes, and all work done in the machine shop is drafted before the project is made there.

In conclusion, the money spent for building and equipment in our town is returning a hundred-fold to the community. Industrial education has been advanced, technical training has been developed and discipline improved. The students look with pride upon their workshop, and their interest in school life has increased. With the spacious accommodations many other activities of real worth to the community may be accomplished with the transition of time and conditions.

A Course in Practical Electricity

Raymond M. Bealer, Supervisor, Collingswood, N. J.

OUR manual training shops are just beginning to foster boyish hobbies and by placing before the boy various activities rich avenues of thought are opened. The shop teacher has never before had a broader and more comprehensive work than that offered by the possibilities along electrical lines.

We have all heard it said that a cause of lack of interest in the old type of woodwork was that certain boys did not want to be carpenters. Electrical courses may not develop electricians, but it is beyond dispute that with our modern civilization practically everyone needs some knowledge of the laws of this servant of mankind. The motor car and tractor with their electrical ignition, starting and lighting systems have compelled the successful operator and owner-repairman to acquire a practical knowledge of this subject.

The equipment necessary for a course of this kind is simple and inexpensive. The materials are cheap. A library of reference books which should be found in every shop is essential to good results.

COURSE IN PRACTICAL ELECTRICITY.

7TH GRADE.

Projects.	Tools.	Materials.	Interrelated subject matter.	Discussion & Operations.
Types of batteries. Dry and wet cells.	Pliers Galvanometer.	Old dry cell. Sulphuric acid. Copper, zinc. Jar of water. Insulated wire.	Where materials are found? How found? Refining of metals. Development of present dry cell.	Opening and examining dry cell. Sketch dry cell. Dry cell composed of what materials? Detecting presence of electricity by galvanometer or compass. Electricity generated by chemical action. Battery solutions. Different kinds of batteries. Action of acids on different metals. What kind of battery most satisfactory?
Connecting up cells Series & parallel.	Pliers Galvanometer. Volt-ammeter.	Dry cells. Insulated wire.	How electricity is conducted. Drawing of wire.	Connect dry cells in series—in parallel or multiple. Report result in volts, in ampheres. Electrical units of measurement, volts ampheres. Compare with water pressure.
Making an electro-magnet. Making a permanent magnet.	Pliers.	Wire nails. Insulated wire. Dry cell. Iron filings. Needle & thread. Permanent magnet.	Magnetic pole-where located. Lode stone. Compass & its commercial use.	On what does magnetism depend? What machines depend on magnetism for their operation? Difference between permanent & electro magnet. Polarity of magnets. Simple microphone & telephone circuits.
Bell wiring. Single bell & button. Single bell & 2 buttons. Single button and 2 bells. Ring & return ring 3 wires Use of 1 wire and ground.	Hammer. Screwdriver. Staples. Pliers.	Bells. Buttons. Dry cells. Bell wire.	Development of warning signals. Knocker to bell. Figuring cost of installing a bell.	Why a bell rings? Compare with other electric machines. Make drawing of bell circuits. Trade symbols for bells, batteries & buttons. Trace inside wiring of bell. Sketch bell circuit.
Wiring minature lamps. Series & multiple. Wiring table & floor lamps. Christmas tree lighting.	Screwdriver. Pliers.	Miniature lamps. Miniature sockets. Dry cells. Transformer. Bell wire.	Early history & development of incandescent lamp. Making and refilling lamp bulbs. Insurance rules on inide wiring. How electricity is sold. Candle power and watts.	Advantage & disadvantage of series, of multiple. How are lamps protected from too much current? Testing & replacing fuses. Reading meter. Automobile lighting systems. Ground return. Construction of key sockets & switches. Use of lamp as resistance.
Making telegraph key & sounder.	Woodworking tools. Riveting set. Drill. Anvil and vise. Soldering iron.	Wood for base and upright. Band iron. Rivets. Knob for key. Tin strip. Insulated wire. Spring. Binding posts.	Early history of telegraphy. Method of sending and receiving messages — Composition of same. Value to industry & world at large. Submarine cable. Duplex telegraphy.	Compare telegraph sounder with electric bell. Install and operate a telegraph line. The Morse code. Why are relays needed? Types of batteries used and why. Telegraph transmission lines.

8TH GRADE.

Projects.	Tools.	Materials.	Interrelated subject matter.	Discussion & Operations.
Study of induction coil. Auto ignition.	Pliers.	Low tension or kick coil. Induction coil. Spark plug. Wiring.	Effect of induced electricity on human body. Electro-therapeutics. Other types of internal combustion engines.	Kick coil compared to water hammer in a water pipe. The most desirable form of a core & why? Primary & secondary windings. How is the secondary current induced? Vibrating & non-vibrating coils. Action of condenser. Duty of breaker box & timer.
Electro-plating. Copper - plating a carbon rod or spoon.	Pliers.	Dry cells or transformer. Copper sulphate. Old battery or arc light carbon. Jar of water. Sheet of copper.	Galvanized iron. Tin plate, where tin is found.	The need of plated ware. Commercial use. Where does the plating come from? Can it be returned? Electro-typing.
Making an electric motor.	Woodworking tools. Anvil. Drill. File. Soldering iron. Hack saw. Snips.	Wood for base. Band iron. No. 18 bell wire. Cartridge shell for commutator. Thin copper for brushes.	History & development of power — water, steam, electric. Commercial value of motor. Calculation for H. P. Starting boxes and rheostats.	What makes the motor turn? Office of commutator; of brushes. How to reverse motor. Polarity of magnets. Effect of different size wire on field; on armature. Could field be a permanent magnet magneto?
Electrolysis of water	Pliers.	Jar of water. Sulphuric acid. 2 test tubes. Dry cells. No. 18 bell wire.	Of what commercial use is hydrogen? The balloon & dirigible. Commercial use of oxygen.	Composition of water. Could water be made by combining H. & O. Anode & cathode. Why does the hydrogen explode? Amount of electro-chemical decomposition dependent on quantity of electricity passing.
Making electric toaster. Test conductivity of different materials by use of test lamp. on light circuit. Resistance tests with different size wire.	Pliers. Drill. Folder.	Asbestos. Sheet mica. Resistance wire. Galvanized iron.	What is asbestos? Where does it come from? Commercial use of it. Calculation of length of resistance wire.	Unit of resistance. Conductivity of metals. Does size of wire affect resistance? Why use asbestos or mica? What electrical apparatus operates on the same principle as toaster?

9TH GRADE.

Projects.	Tools.	Materials.	Interrelated subject matter.	Discussion & Operations.
Making transformer.	Woodworking tools. Snips. Soldering iron. Pliers.	Wood for base and clamps. Sheet iron. Copper ribbon. No. 18 insulated wire. Contact posts. Binding posts.	Commercial use of transformer.	Difference between transformer & induction coil. Principle of step-up and step-down transformer. Self regulation. Oil, air and water cooling of transformer.
Wireless telegraphy.	Bench tools. Snips, Pliers. Soldering iron.	Wood. Wire. Brass rods. Binding posts.	Its value to the world. Discovery & history. The different types.	Making tuning coil. Cabinets for auxiliary apparatus. Method of connecting units.

The Enforcement of Compulsory Part-Time Attendance, with Special Reference to the State of Michigan

K. G. Smith, State Supervisor of Industrial Education

A MODERN educator has said that the aim of education is to give every normal child the opportunity to become, within his capacity, an efficient worker, an intelligent citizen, and a true man. Most educators agree enthusiastically with this definition, but few seem disposed to actually put it in practice. Let us ask ourselves this simple question, "Can the public schools provide the opportunity called for by the above definition?" The answer is, "no." But suppose we ask, "Can the community or state, if it will, provide this opportunity?" The answer is, "yes." The simple meaning of this is that agencies other than the public schools must be utilized for educational purposes if the aim of education stated above is to be realized. That it is the duty of the state through its authorized educational agencies to see that this aim is realized for all normal children is the fundamental social basis for part-time instruction. Educated citizens are society's greatest resource. The uneducated and socially unfit are its heaviest liability, as our prisons and reform schools show. If society sets up education as defined above as a test of citizenship, then it is the duty of the state to provide the means of meeting it and to see that these means are used. This is the social basis for compulsory school attendance and it is with compulsory part-time attendance that this discussion deals. The function of a part-time school, however, is social adjustment rather than the teaching of a section of knowledge and this difference in function affects the school organization, content and method of instruction and to some extent policies to be followed in the enforcement of a part-time law.

We all realize that if schools and teachers were all they ought to be, if all parents, children and employers realized the benefits of education, there would be no need of compulsory education laws. The fact is, we do need these laws and the question before us is, "How can they be enforced most effectively and justly in their relation to three social factors?"

1. The employer.
2. The parent and child.
3. The community.

These factors will be taken up in turn.

Part-time Attendance and the Employer.

We have all had experience with employers who either discharge or refuse to hire boys and girls subject to the part-time law. Girls as a rule are the first to be eliminated. The only remedy I know for this condition is to bring the employer to see the value of the school for his employee and for the community as a whole; in other words, to develop his sense of social responsibility even to the extent of his paying for time spent in school.

Our Michigan law allows a school superintendent to excuse a boy if he would "by reason of part-time school attendance be deprived of wages essential to his support or that of his family." This possible excuse has not been used to any extent in our state. The plan of most part-time school directors in case of threatened discharge is to find the boy another job. This is not easy in a time of industrial depression like the present.

In talking and dealing with employers I have found it much more difficult to convince them of the value of eight hours a week than of four. A half a day a week for school is much easier to arrange than two half days. Furthermore, I am not convinced that our schools at present make the best use of the full eight hours. The longer time makes the work less intensive and for that reason less effective than it should be in a part-time school. For this and some other reasons, we have in the Michigan law a provision that four of the required eight hours "may consist of supervised instruction under working conditions, provided such instruction meets the approval of the superintendent of schools and the State Board for Vocational Education." If an employer is honestly endeavoring to educate and train his employees and is willing to report on their progress to the superintendent of schools, he should have credit for his educational effort. The school on its part should have at least four hours per week for general education of the proper type in order that the plan may not result in a training too narrowly vocational.

Of course, we may say that the employer should do all he can during the working period and leave the full eight hours to the school. In my opinion such an arrangement is not cooperation because it does not give the employer credit for his educational effort. For example, the Bell Telephone Company has a very complete system of training for its operators. We have tacitly assumed that a part of the eight hours spent in school is for vocational subjects and a part for general education. For the telephone operator, the vocational work is telephone work, and the Bell Telephone Company can give this work much better than the school. I realize that this means nothing more nor less than supervised employment for educational purposes. This is in accordance with the social principles stated at the beginning of this discussion, and I rather think that we shall have to make more use of supervised employment, especially for boys and girls over 16 if our programs of part-time education are to be a success. In what other way can we recognize the educational value

of real work under commercial conditions? In what other way can we develop better the employer's sense of social responsibility? In regard to the principle of school supervsion of employment, Frank M. Brewer, manager of Wanamaker's, says: "I would like to see our school boards have jurisdiction over the children who 'work' equally with those who are in school; controlling their employment engagements, taking cognizance of and giving credits for their physical condition and progress in their work quite as in other school studies."

The question of permits in its relation to employment has been a troublesome one. In our state the county commissioner or city superintendent of schools issues the permits. It is the duty of the factory inspectors as employees of the Department of Labor and Industry to see that juvenile workers have permits and to bring action against an employer for the illegal employment of juveniles. The difficulties inherent in this divided authority are obvious. The best solution at present is close cooperation between the officer issuing permits and the Department of Labor and Industry.

Due to the newness of our law, school superintendents have been slow to recognize the fact that permits are now required up to the age of *17 years in all cases.* Working permits are required in case a child goes to work, and domestic permits or excuses if a child remains at home to help in the family. Both these permits are issued subject to part-time school attendance.

Part-time Attendance and the Parent and Child.

Our former part-time law provided no penalty on the child for non-attendance save revocation of permit, and no penalty whatever on a parent who refused to allow his child to attend. When a child is out of work, revocation of permit is not an effective means of enforcement. Our new law provides for enforcement on both parent and child in exactly the same manner and by the same officers as our compulsory education law. The permit may also be revoked as was formerly the case. The jurisdiction of our juvenile courts extends only to the age of 17 years. Truants are subject to the juvenile court, consequently the upper age limit of our part-time law is 17 years and not 18, as in some other states.

Our law does not provide for full-time attendance of those out of employment. Those who work at home are subject to the same requirements of part-time attendance as those employed in commercial establishments. The fact that boys and girls over 16 years of age are not required to attend school more than eight hours a week when out of work is perhaps unfortunate. It does, however, relieve the part-time school of some very serious administrative problems which would arise if full-time attendance were required during periods of unemployment.

One provision in our law has been found difficult to enforce. Boys and girls working in a district where there is a part-time school are required to attend either there or in their home district. Frequently the home district has no part-time school. The difficulty here is evident. If a boy is absent he must be followed up, not in the district where he attends school, but where he lives. This is another case of divided authority and the best solution is cooperation between the school authorities in the two school districts.

Part-time Attendance and the Community.

The number of pupils in a given district in Michigan making the establishment of a part-time school obligatory is fifty. We have several cities in our state which were progressive enough to start part-time schools when the number had not yet reached fifty. These schools like all part-time schools have grown in number and popularity. Provision should be made for a part-time school as a necessary and vital part of a school system. Hesitation in establishing the work due to conservatism and lack of initiative is unpardonable. The question is no longer, "Is it worth doing, but how can it be done most effectively?" The future success of the part-time school as a public institution will depend upon its popularity; its popularity will depend upon real service; service will come with adequate facilities and expert, trained teachers who have full sympathy with the part-time idea; and lastly, an educated public which has seen the work actually done. How to get children to stay in school will become less and less of a problem as the benefits of a part-time school with proper support become the factor they should be in the community.

In every community there are other educational agencies besides the public schools. Part-time education depending as it does on state guardianship and providing, as it should, for employment supervision should be under public supervision and control. Sometimes a local institution may give instruction in vocational subjects not taught in the public full-time or part-time school and a part-time school pupil may desire to attend. It is not right in this case to deprive the pupil of the privilege of such instruction unless instruction fully as good can be given in the public school. The child has a right to ask to be made vocationally competent, and it is the duty of the public school to see that this condition is fairly met and that this instruction is satisfactory wherever given. In case, then, a pupil seeks vocational instruction in a field not covered by the public schools he should receive credit for time spent under such instruction provided this instruction meets the approval of the city superintendent and the state board. When such credit is given it is the duty of school officials to see that the vocational instruction given is satisfactory and that a record of vocational progress is kept. Attendance of such pupils should be required for a part of the required time at the public part-time school, thus providing for both vocational and general education. The child is a ward of the state up

to the age specified in the law, and it is the duty of the state either to provide vocational education for the child or to see that he gets it on a just and fair basis.

This same principle applies also when exemption from part-time school is claimed on the ground of educational work completed. Let us take a specific case. The question is often asked whether a two-year business college course is "equivalent" to two years of a four-year high school course. The question must be decided in each locality. No sweeping ruling can be made for a state. The business college course in any locality should be submitted for the approval of the superintendent of schools and the state authorities. If it is "equivalent" educationally, credit may be given and a graduate of this course excused from part-time school attendance.

In certain cases a business college course may be *vocationally* equivalent to two years of high school, though not equivalent from the standpoint of general education. In this case a graduate of the course may be required to attend part-time school for four hours a week up to the age limit. Such a procedure assumes that the part-time school can contribute nothing further directly to the pupil's vocational preparation and can contribute only to his general education.

Conclusion.

To sum up briefly, the enforcement of part-time attendance laws does not mean solely and simply compelling a pupil to attend a school at a certain place and to take certain specified subjects. It means that the state as the guardian of the child will see that he is aided in choosing the career for which he is fitted and has all the assistance possible in fitting himself for that career both technically and as a citizen and a man. This may mean, as pointed out, the utilization of agencies other than public schools for educational purposes under public supervision. I do not mean to convey the impression that pupils of part-time school age should be dependent upon private institutions for vocational instruction except in very special cases. It is the duty of the state to provide at public expense vocational instruction of as good, or better grade, than that offered by private institutions except in occupations for which there is not sufficient demand in any community to warrant the establishment of a school. Supervised employment is based on the sound social principle of state guardianship and means merely its extension from school to work.

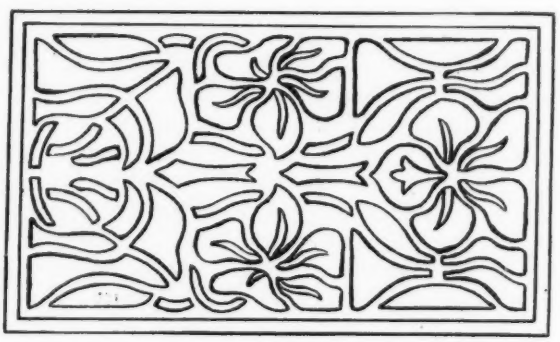
Useful Nasturtium Designs

D. Elizabeth Roberts, Philadelphia, Pa.

The nasturtium designs shown in the illustrations may be used in a number of ways. They are especially suitable for decorating small boxes or novelties, and the two circular designs could also be used as medallions on the tops of large boxes.

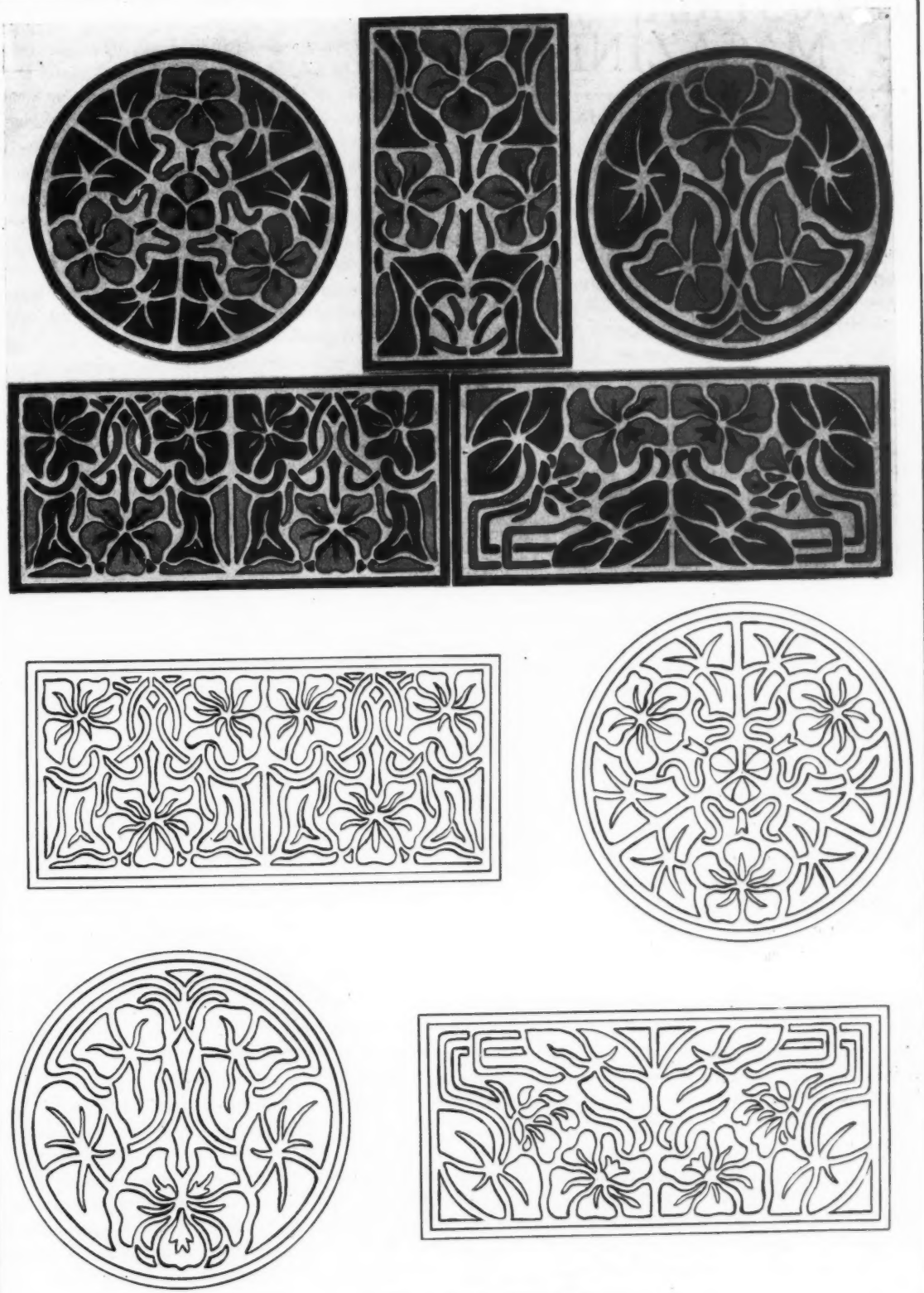
If the objects to be decorated are of tin, ivory or wood, the decoration should be done in oil paints mixed with a small quantity of white enamel, or enamelac, a prepared product for such work could be used. If the background is to be painted, float the enamel on the surface with a large brush, and allow it to dry thoroughly before putting on the design. Black enamel makes a very good background. In order to transfer the design on a dark surface, first trace it on tracing paper, then cover the back with powdered chalk or talcum powder. Place this on the article with the chalk side down, and go over the outline with a pencil. The flowers are pretty done in the natural colors, either yellow with orange markings or a reddish tone with darker markings, and the leaves and stems should be in tones of green. A fine outline of some dark contrasting color greatly improves the design.

These nasturtium motifs may also be adapted as decorations for many different pieces of china. The circular designs can be used for centers of bowls or tops of powder or bon bon boxes, or as medallions on trays or vases. The rectangular panels can be used on tiles or tops of boxes, or without the enclosing lines, the designs can be used on bowls or vases, or any object of cylindrical shape. The borders can be used around the tops of bowls or any object of similar shape where a border would be suitable.



DESIGN FOR A PANEL.

Last but not least, the designs may be used effectively as stencils to decorate household articles, as curtains, pillows, table covers, etc. The rectangular panel, repeated, would make a good design for curtains, while the two borders would be effective on table runners, or curtains, or across the top and bottom of a pillow. If these designs are used as stencils, the markings on the flowers should be cut out with the stencil, and these may be touched in afterwards with a small brush. Also where the stems are very long, they should be divided into sections, otherwise, the stencil would be too weak.



EXAMPLES OF NASTURTIUM DESIGN.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

THE QUEST FOR UNEARNED HAPPINESS.

One of the fatal tendencies of the times is the disposition to seek pleasure and happiness for which no adequate return is made. The young man and young woman take without thought and without thanks the hard earnings of parents that represent a lifetime of struggle and self-denial and squander them in the indulgence of pleasures to which they have no just rights.

The world seems to have gone mad in the pursuit of pleasure without stopping to define it or to inquire how it may be justly and surely attained. There is a movie madness, an automobile madness, a holiday madness, a summer tour madness, and various other species of madness for pleasure among people who have never earned the right to real happiness. They have never done a real task of service; they have never contributed to the genuine happiness of others; they have never achieved anything that brought happiness and satisfaction as its own reward. They are spongers off of the patience, forbearance, industry, frugality, and fortunes of those who have had to pay the price.

What young America needs to learn is that happiness cannot be bought with the money, the energy and the self-denial of *others*. Genuine happiness is a personal thing, and it comes as a *reward*—never as a gift or legacy.

Another thing that must be learned is that happiness is always *incidental*. It cannot be won as a main objective. It never comes single-handed. It is always found in company with service, achievement, love, goodwill, and worthy effort. These are the prices of happiness and no one can attain it who does not bring them to its altar.

In this dollar-mark, short-day, long-play, no-work, pleasure-seeking age, it is the duty of every teacher to bring this message constantly and effectively to the rising generation, to the end that there shall no longer be a quest for unearned happiness, but that the quest shall be for those higher things that bring complete and enduring happiness as a *reward*.

COOPERATIVE SCHOOL WORK.

The most significant element of interest in the exhibitions of art-industrial work during the past year was the cooperative group project.

For reasons which we may not well explain, a group will work together on a school project with greater interest than they will show as individuals in working upon individual problems. We believe, however, that the cooperative project has peculiar advantages aside from the interest in cooperation. A group is composed of more or less capable individuals. The less capable pupil will be obliged to put forth his best efforts to hold his place in the cooperative project. In a problem of his own the less capable boy or girl will often give up in despair, or work indifferently, because he knows from the beginning that he can only expect a secondary or inferior result. The obligation of sustaining the group is a healthy and righteous obligation for every individual to assume.

If there are disadvantages in arranging school work to be done in cooperation, they are the lack of opportunity for individual expression and the difficulty of keeping everybody busy all of the time. The first of these has been very much over-emphasized. Individuality so often reverts to eccentricity that we are inclined to the belief that worth-while individuality will assert itself in spite of all obstacles.

As for keeping everybody busy on a group project, there is some difficulty. There again we see no reason why a little adjustment as the project goes along in the way of helping each other will not only keep all hands at work, but at the same time lead to a fine cooperation. Let us develop the idea of team-work in the industrial arts as it has been developed in athletics. The tendency seems to be in that direction.

MEASURING FREEHAND DRAWING.

We have in hand a measuring scale for freehand drawing, devised under the supervision of Linus Ward Kline and Gertrude L. Carey, and published as a study in Education by The Johns Hopkins University. The study is a timely and valuable attempt to standardize the judgment of freehand drawing done by pupils of the public schools. The examples of work from which the standards are taken come from comparatively few schools of the country, but the standards are made significant by the cooperation of teachers of art and teachers of other subjects in the public schools, teachers of academic subjects in colleges, laymen, and artists.

Beginning with zero grade for drawings that cannot be recognized as illustrating the object, the grades of excellence are carefully established and explained to a standard of clear graphical expression.

Teachers may never agree as to the exact relative educational importance of the various technicalities of drawing, but there is no reason other than indifference to the subject why freehand drawing should not be standardized as other academic subjects are standardized. We believe much of the indifference to art study in our schools has resulted from the undeniable fact that the work of consecutive grades shows little consistent development.

We may hope for a remedy of this deplorable lack of standard when a definite and understood accomplishment may be expected from a specific school training.

THE SUMMER DIVERSION.

There are indications that the summer schools of this year are well attended. This is one index to the raising of standards in the teaching profession. In spite of teachers' low salaries and financial depression, our summer schools have grown gradually until now they have become established to the point where the ambitious teacher can get competent training in the line of his particular interests.

The summer vacation has seemed too long to some, and to others too short, according to the point of view. If that view includes ambitious development of ability to teach better and to progress with the teaching profession, then the long summer vacation is a great opportunity, and seems none too long. If the teacher looks upon the summer vacation as an opportunity for recreation, it is probably too long. To the right-minded healthy teacher a rest of three months in the year is not necessary nor desirable. The normal mind and body can recuperate in much less time than that.

We believe that the steady growth of summer schools will continue, for we believe that teachers will grasp the opportunity peculiar to the ambitious profession of teaching by developing their capacity for more and better work during the long summer vacation.

DR. L. D. HARVEY.

In the death of Dr. Harvey the field of manual training and vocational education has lost one of its most stanch, sane and conspicuous leaders. He was one of the outstanding figures in the whole realm of education.

Dr. Harvey might have been classed as the orator type of educator, being a speaker of great fervor and power and possessing a rare and magnetic personality. He belonged to the group of educators of which William T. Harris was a conspicuous leader. It included such people as Francis W. Parker, John W. Cook, Ella Flagg Young, and others of this type. He espoused the cause of manual training during its early struggles and really helped to get it a hearing in the councils of education.

Wisconsin was the scene of Dr. Harvey's chief activities. He served three terms as State Superintendent during the formative years of Wisconsin's educational and political life. Retiring from the State Superintendency, he assumed the Presidency of Stout Institute. Through his influence Stout Institute became a state institution and one of the few great schools for the training of manual and vocational teachers.

Dr. Harvey died in the line of duty, in the service of the institution which he had served so long and so well. He made a unique contribution to the life and character of manual and vocational training. He was a leader and a pioneer who will not be forgotten.

THE PLASTERER'S TRADE.

A contractor was heard recently to lament the extreme scarcity of high-grade plasterers and cement workers. He remarked that except for three men in his employ, he knew of no first-class cement finishers for foundation work in one of the very largest cities in the West.

This is a rather disturbing fact in the building trades. Furthermore, the outlook for improvement is anything but encouraging, since the number of apprentices in this trade is very much short of the normal demand. Why this is so, is not easy to determine. The pay is good, hours are reasonable, employment is constant since plastering has ceased to be a short season occupation, and the general conditions are good. Perhaps, as some expert plasterers maintain, the work is too hard to attract the snap-seeking young men of this day. The work is undoubtedly hard and much skill is required, thus making the apprenticeship period rather long as compared with the work and training of such lines as the much-talked-of "auto mechanics" courses to which young men flock in great numbers.

Whatever the reason for the situation may be, the situation itself is serious. Perhaps some help could be rendered in vocational guidance and advisement courses by calling the attention of young tradesmen to the needs, the opportunities, and the rewards of the plasterer's trade.

A MAN'S WORD.

What is a man's word worth? We are given to saying of an honorable man that "his word is as good as his bond."

On some of our pessimistic days we feel that men whose "word is as good as a bond" are few and far between. The irresponsibility of great numbers of people sometimes strikes us with sinister and appalling significance. After all, if a man's word is not good, what claim has he to credit, confidence or respect?

Let every child be taught in all matters, large and small, that when truth is gone all is gone; that reliability in great affairs of life grows out of honesty and fidelity in those apparently inconsequential matters that spring up in every-day life. Truth recognition and truth telling must become habitual if the philosopher's dream of an ideal state of society is ever to become any more than a dream.

A GREAT PURPOSE IN ART EDUCATION.

A glance back over the ages impresses one with the universality of the art instinct—weak and struggling here, strong and virile there, but ever present, differing only in degree and kind. We find it woven and carved, hammered and infused and generally breathed into nearly every known substance. Ever present, common to all, we find certain enduring qualities of patience, perseverance and sincerity, and the observance of certain satisfying principles and harmonizing laws. Our business seems to be that of perpetuating and refining this instinct for expression in the light of what the past teaches, the present requires, and the future promises. In the fostering of these instincts and the perpetuation of these standards lies the hope of tomorrow—a hope for deeper feeling, finer workmanship and nobler living. Our hope for accomplishment must be founded upon unbounded faith in childhood. Our approach must be thought out in the spirit of democracy.

—C. V. Kirby.

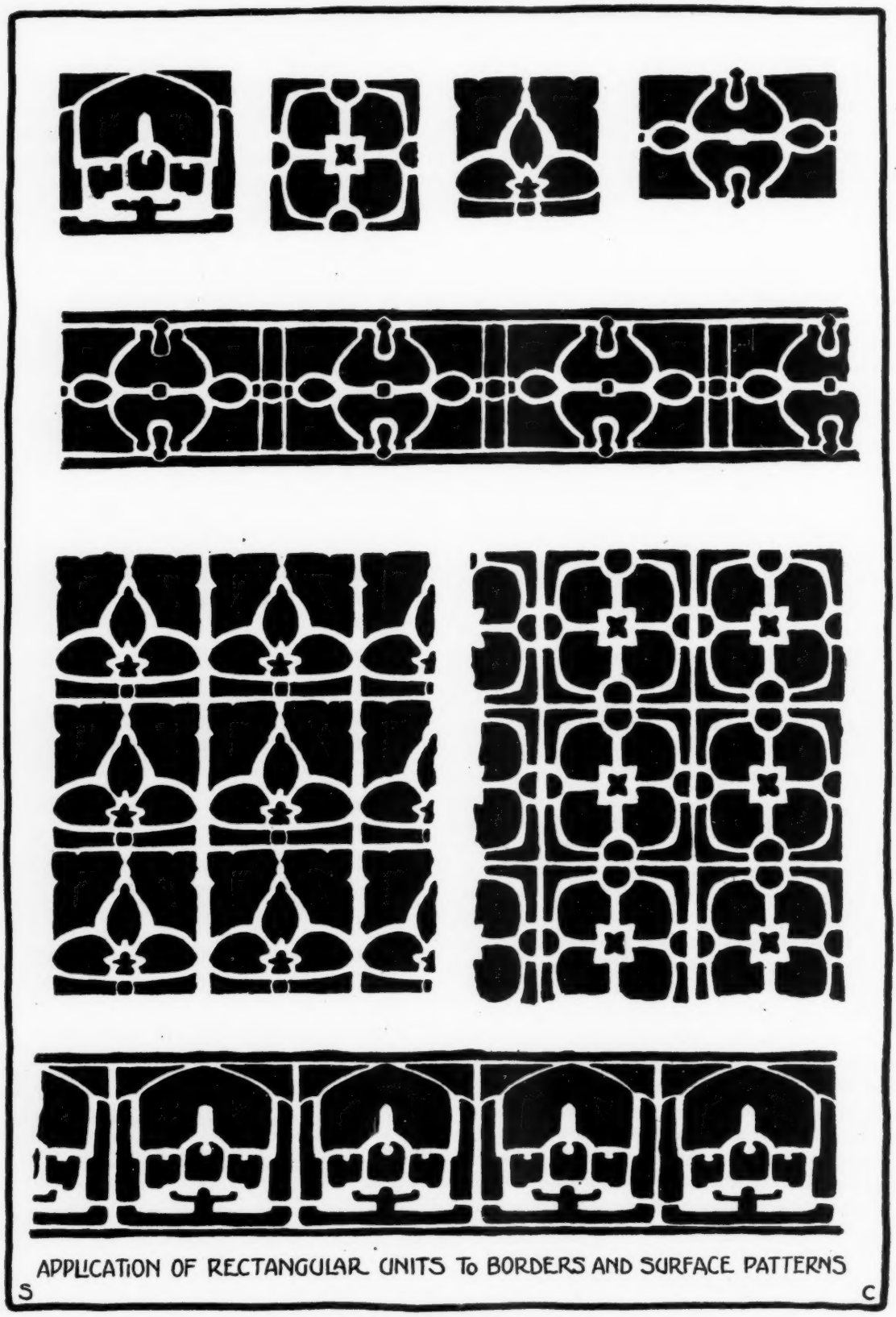


PLATE VI

THIS IS THE SIXTH OF A SERIES OF TWELVE PLATES BY MISS SARA COHOON, ART INSTRUCTOR, JUNIOR HIGH SCHOOL, SPRINGFIELD, MASS.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

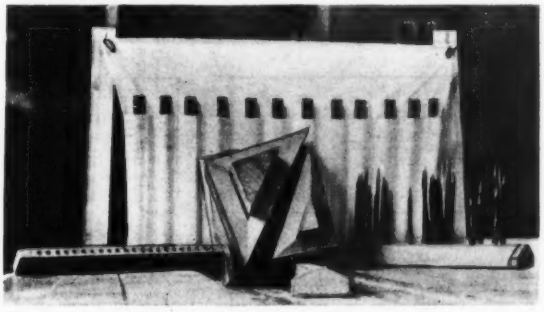
Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

HANDY DEVICES FOR THE SHOP-DRAFTING ROOM.

A. R. Mitchell, Emerson Junior High School, Madison, Wis.

Far too often, manual training instructors are required to teach drafting in their shops, and anyone who has faced this problem fully realizes the many disadvantages under which this work is carried on. One of the chief worries of the instructor in handling drafting work under ordinary conditions is that of caring for supplies, such as pencils, scales and triangles. While handling several large classes in drafting work in a crowded shop, the writer devised the following utilities which not only relieved the work of distributing and collecting, but also served to check up at the close of class.

The scale holder can be made of any heavy cloth, with pockets—open at the top and closed at the bottom—two inches wide, with a flap at the top with button-holes at the corners to hang them up and the flap to fold over



HANDY DEVICES FOR THE DRAFTING ROOM.

the exposed ends of the scales when the holder is rolled up. This holder is easily made and will soon pay for itself, since it serves to protect the sharp edges of the scales when rolled up and stored away. A holder for a dozen scales is the most convenient size to use.

The triangle block serves as a good check up device and also as a protector of the sharp points and edges of the triangles, particularly wooden ones.

The pencil holder can be made with one or two rows of 5/16″ holes, depending upon the number of pencils used in the work, the holes to be numbered on the faces of the block, and numbers assigned to each student. To facilitate matters where several classes are taking the work, the grade and hour of the class can be lettered on the support, at the end of the holder. By means of this holder the instructor can readily pick out the poorly sharpened pencils and act accordingly.

A HACK SAW FRAME.

W. R. Challoner, Appleton, Wis.

My grandfather was an old man when he laid aside his tools of the workday world. I find among them a hack-saw frame which I have had in my possession about 25 years, a modification of which I have used as a problem in my school classes. This old tool had an adjustable frame which was made in two parts, tongued and grooved and fastened together by two flat headed screws. The blade tightening screw was the same as this one, but the terminal or clips were made of forgings.

After studying the accompanying drawings of frame and tools for making the same, it will be seen that this is not a difficult problem, but one which requires some careful workmanship to produce good results.

In making this tool, it is best that the frame be forged first, care being taken to get the length between the ends to the proper dimensions. If you wish to use a shorter or longer length blade, change these dimensions one inch for every inch of blade length desired.

The clips are the next part to be made. After the stock for the blank is out, have the student lay out a center line across the blank, using the square and scriber for this purpose. This will give a starting point for forming No. 2 clip.

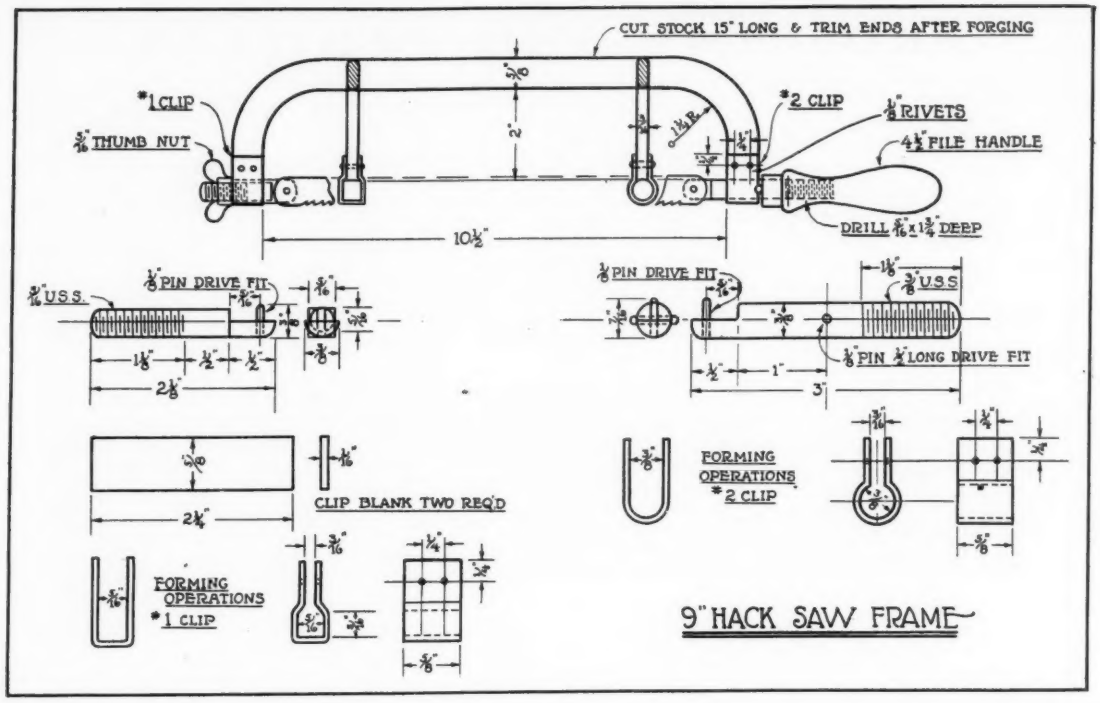
No. 1 clip should be laid out with a line 5/32 inch each side of the center line and scribed as before. In forming this clip, place the blank in a vise so that one of these lines is even with the top of the vise jaw. Then bend to a right angle, making a sharp corner. Next place the clip on the forming tool or mandrel, using the thick end so that the other line is flush with the tool, and place the edge to the jaw in a vise. Then bend to a sharp corner. The piece now is a U shape with square corners. Now place the piece on the thin end of the mandrel and pinch in a vise 1/16 inch above the narrow ledge, closing the blank as shown in the drawing.

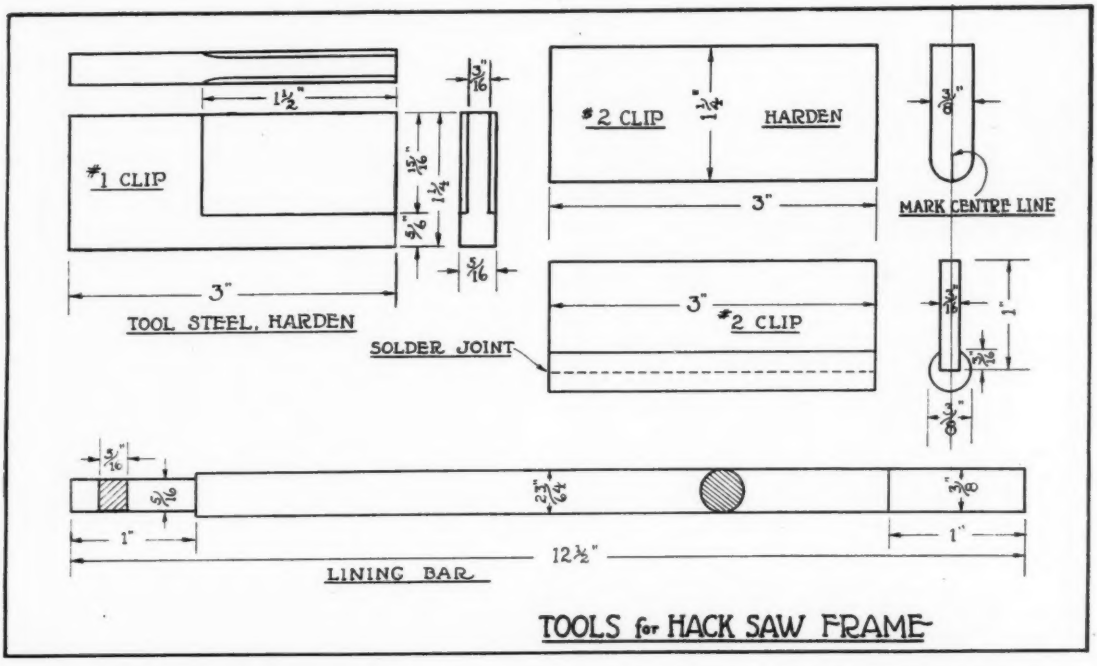
In forming clip No. 2, place blank and mandrel in the vise so that the center line of the clip and mandrel are in line with the edge of mandrel against the vise jaw. Then bend over the radius making the U shape blank. Place on the second mandrel and close blank in vise same as with the other clip. If the work has been carefully done, the ends of the blank will be of the same length. If they are not, file down the end so they will be even. Next lay out the holes for the rivet.

When assembling, pinch the clip in a vise so that the open end will just pinch over the frame and stay in place. Now place clip to the lining bar and hold the bar against the end of the frame. This will keep the clips in line when drilling for rivets. I find that it is a good policy to drill one hole and assemble the rivet in each of the clips, and then the second hole. This will prevent the holes from getting out of line, and make a firmer job. The lining bar may now be removed and the frame finished.

When making the adjustment, screw round both ends of the stock and turn down the end to 5/16 inch for threading. If you have no lathe, this work may be done with a file. Now square the piece to fit clip No. 1. Care should be taken when flattening the end to have it at right angles with the square. When drilling holes for the pins, use a No. 32 drill, and a piece of ⅛ inch drill rod for the pin.

For the handle terminal, round the ends of the stock and cut threads. Flatten the end and drill two holes with a No. 32 drill, being sure that the hole next to the handle is at right angles with the flat on the end of the piece. A file handle may be forced on to the threaded end of this piece with a rotary motion and will make a good handle. Be sure that two notches are filed in the terminal clip so that the blade will be in line with the tightening screw, and will not twist when pressure is applied to the blade.

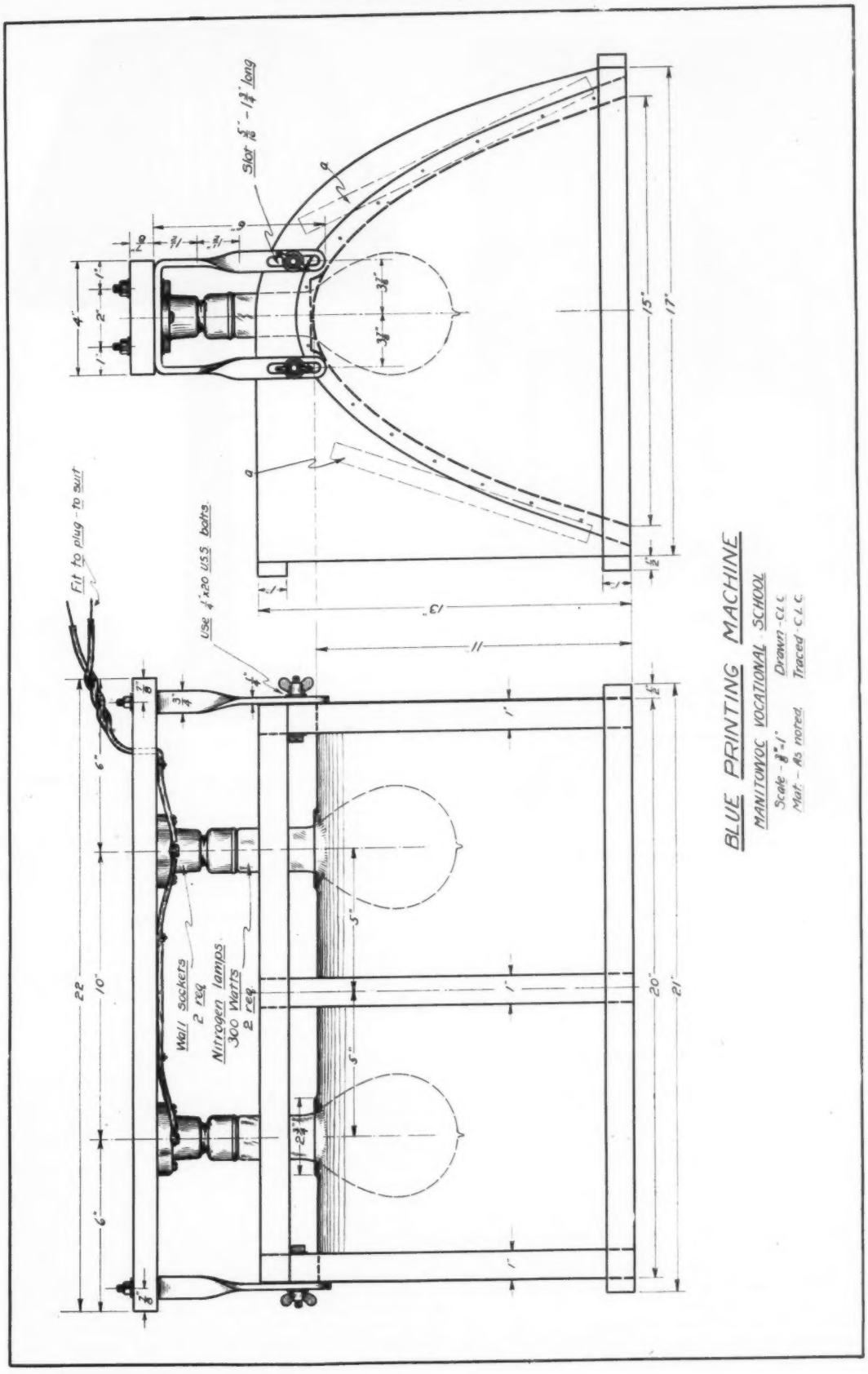




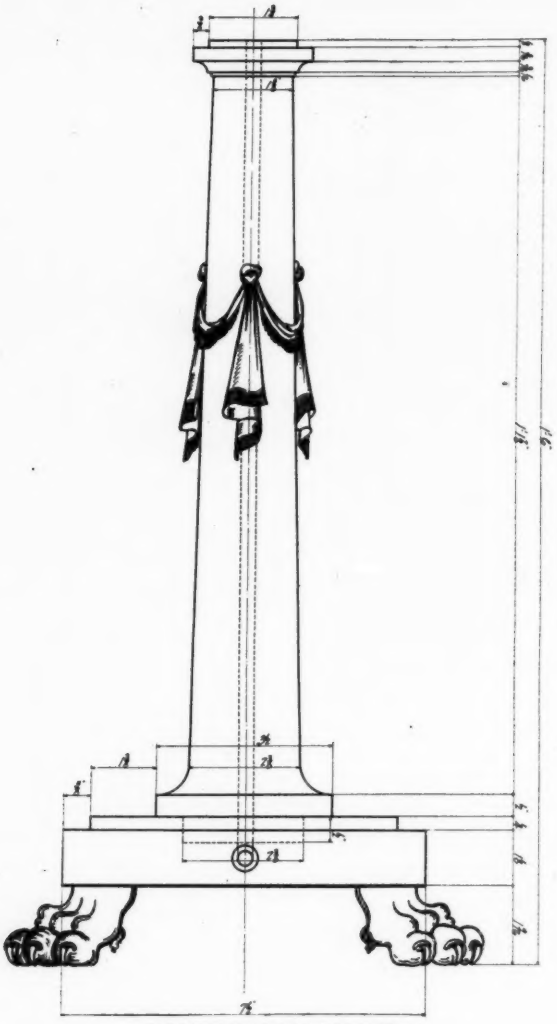
BLUEPRINTING MACHINE.

Chas. L. Conroy, Manitowoc, Wis.

There are numerous times when blueprints are desired and when it is impossible to use sunlight and a machine of this type will fill requirements; especially so, if the price of a manufactured machine is prohibitive as in the average school drafting room. The drawing will illustrate the construction of one which we built for this school to use in emergency and has proved successful. The reflector is made of highly polished tin and is parabolic in form. The adjustable lamp board enables the proper focusing of light to give an even distribution of light on the paper—this eliminating streaks and uneven printing. Three hundred Watt nitrogen lamps are used, making 600 Watts in all, and this gives an intense light with a reflector, which enables us to produce excellent blueprints with an exposure of four to six minutes. It is advisable, however, to use a fast printing paper, as we have found it most satisfactory. The machine is laid on its side and the printing frame stood up facing the light at about three inches distance from the end of the reflector—this giving a circulation of air across the printing frame glass, which may crack if held against the machine. Three wooden forms are laid out and cut as illus-


Slot ⅜" - 14" long
Fit to plug - to suit
Use 4 #20 U.S.S. bolts
Wall sockets 2 req
Nitrogen lamps 300 Watts 2 req
BLUE PRINTING MACHINE
MANITOWOC VOCATIONAL SCHOOL
Scale - 3"-1"
Mat. - As noted
Drawn - C.L.C.
Traced - C.L.C.

DETAILS OF BLUE PRINTING MACHINE.



DETAILS OF POMPEIAN LAMP.

trated, having a parabola 15″ in width and 11″ in depth. Cleats to strengthen same across weak grain can be fastened as is indicated by (a.) The reflector is nailed to the frame after the lamp holes are cut and edges turned. Then the ends (same material as reflector) are nailed to end forms, allowing ½″ for nailing space. Now the entire inside shows only a highly polished surface—the light rays being reflected from all angles by the tin reflector and ends. Wood braces 1″x½″ hold the machine rigid as illustrated.

TWO FURNITURE PROBLEMS.

Reinhold Forkel, Trenton, N. J.

The working drawings and illustrations reproduced with this article will give the reader an idea of the quality of work being produced by the instructor and pupils of the School of Industrial Arts at Trenton, N. J., and at the same time readily show what can be accomplished as the result of hand training.

The ability to produce something by hand is one of the greatest gifts which God has bestowed on men, and it is only through practice and hard labor that success can be obtained. Hand work should be merged in the widest sense as any other art. Practice and experience in the course of time brings forth proficient men for our industries as artisan and craftsmen.

There is nothing a student will enjoy better than creating something by his hands, and especially so if a bit of carving be applied to the piece he wishes to construct.

POMPEIAN LAMP DESIGNED AND MADE IN THE AUTHOR'S CLASS.

Pompeian Lamp.

This lamp is a fine study of architectural design, with tapering upright and claw feet. The lamp is carved in ash wood and treated in with a green tinge color which is very effective, closely resembling metal.

Adam Dressing Table.

Of the historic styles the Adam style is one of the best adapted for school work, especially for hand training. The construction of this dressing table gives the student the greatest opportunity to get acquainted with the various woodworking tools.

HORSE SHOEING TOOL BOX.

Louis M. Roehl, Ithaca, N. Y.

Many farmers find it good business to do their own horse shoeing. The tool box shown herewith is designed to be constructed by farmers and to carry such tools as are needed for the work. It is constructed of softwood and assembled with finishing nails and wood screws. An old broom handle makes a good handle. The bottom tray is large enough to hold the tools illustrated and has been placed 6″ from the floor so as to be within easy reach of one at the hoof of a horse. The upper tray is placed far enough from the lower one to give plenty of room for the hand to take tools from the lower tray. The two partitions have been placed in the upper tray so as to make a definite place for the farrier's knife at the center and horse-shoe nails in the tray at each end. The cleats which are fastened across the end upright members at the bottom strengthen the upright members and prevent the box from tipping over.

Bill of Material.

2	¾″x6″ x19″	Ends
2	¾″x2″ x10″	Braces
1	¾″x6″ x17″	Bottom of lower tray
2	½″x2″ x18½″	Sides of lower tray
1	½″x3½″x17″	Bottom of upper tray
2	½″x1¾″x17″	
2	½″x1¼″x2½″	Partitions in upper tray

1 piece of broom handle 17½″ long.
4 doz. finishing nails to assemble the trays.
2 doz. finishing nails to fasten the trays.
1 doz. 1¼″ flat head wood screws to fasten the braces and handle.
Small quantity of inside paint.

Directions.

It should be noted that the top of each end upright piece is rounded to a 1″ radius.

The handle is fastened to the upright members by boring a hole into each upright of the same diameter as the handle at hand and ¼″ deep at a point 1″ from the top. The screw is then placed through the end upright piece and into the end of the handle.

It is desirable to slightly chamfer the upper edges of the side pieces and partitions of the trays to allow tools and nails to be taken from the trays without annoyance to the hands of the workman.

INLAID PIN TRAY.

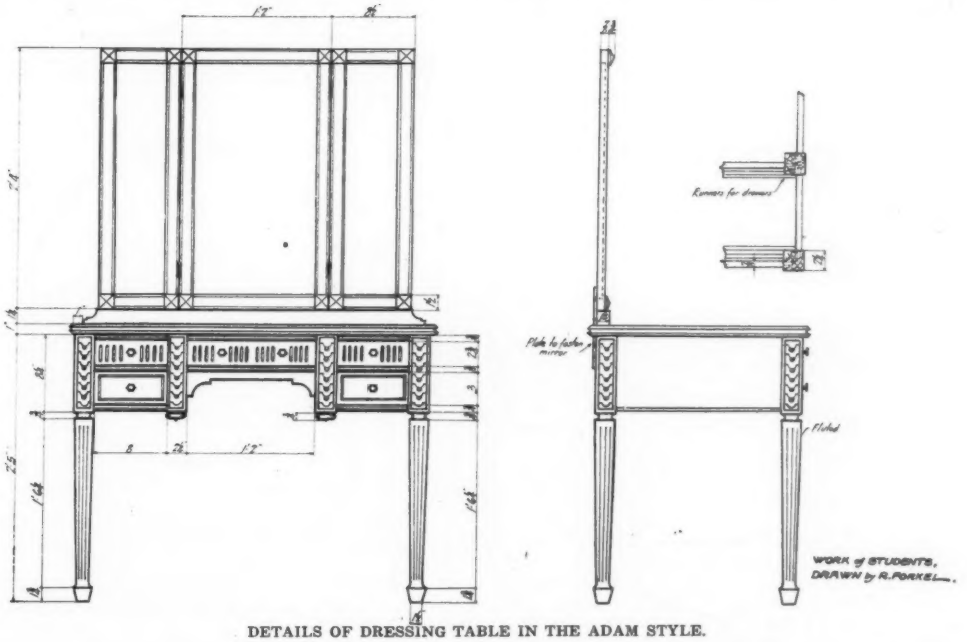
Irl H. Dulebohn, Kansas State Normal School, Emporia, Kansas.

The following plan for turning out attractive bits of inlaid work has been used very successfully by the writer in a beginning wood-turning class in the Kansas State Normal school. The system is suitable for pin trays, small bowls and other light articles and is simple enough to be used in any high school class in wood turning.

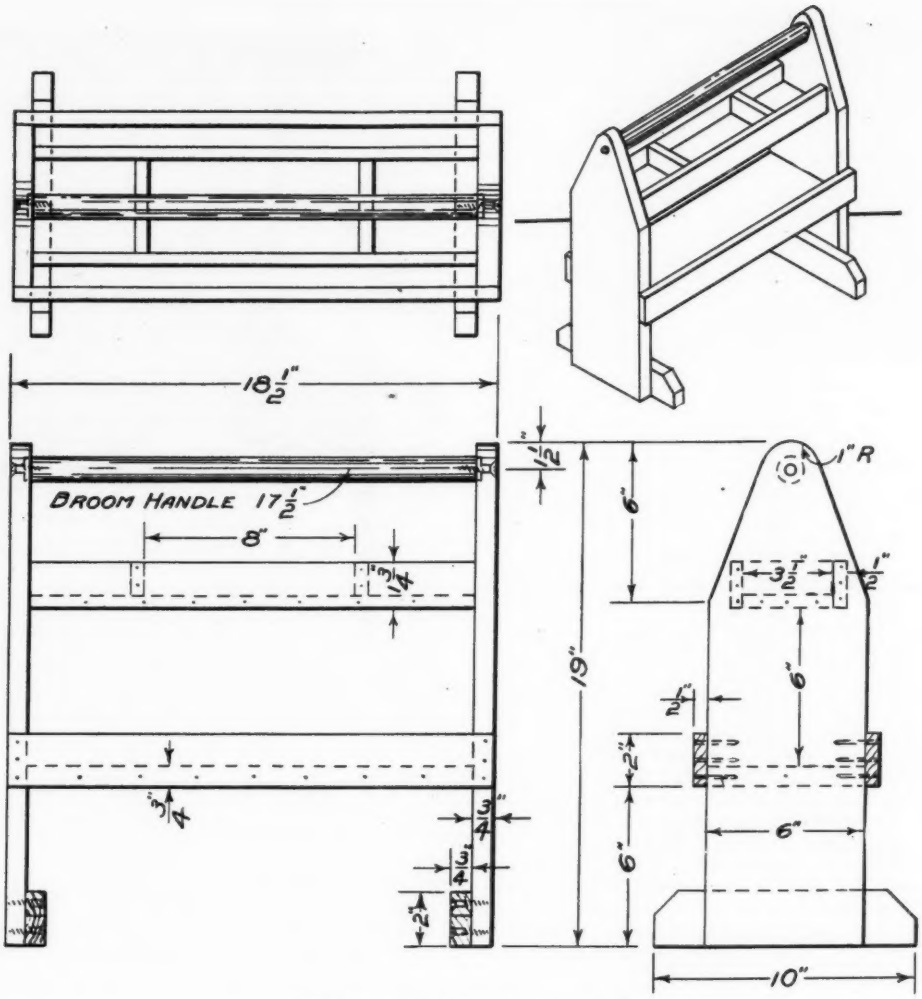
The piece to be turned is screwed to the face plate and the outside is finished in the usual way. A chuck is then turned out and the inside of the project is hollowed out nearly to the desired depth. Then, for the trefoil, or clover leaf design in the cut, three false centers are laid off on the back of the chuck at equal distances from the true center and also equidistant from each other. These false centers will then form an equilateral triangle. One of these centers is then used as a center and a recess is turned in the inside of the project to receive the inlay disc. The disc is turned to fit this hole and is glued in place, and the glue is allowed to harden. The process is repeated with the other two false centers after which the true center is used again and the inside of the project is trued up and finished.

ADAM DRESSING TABLE.

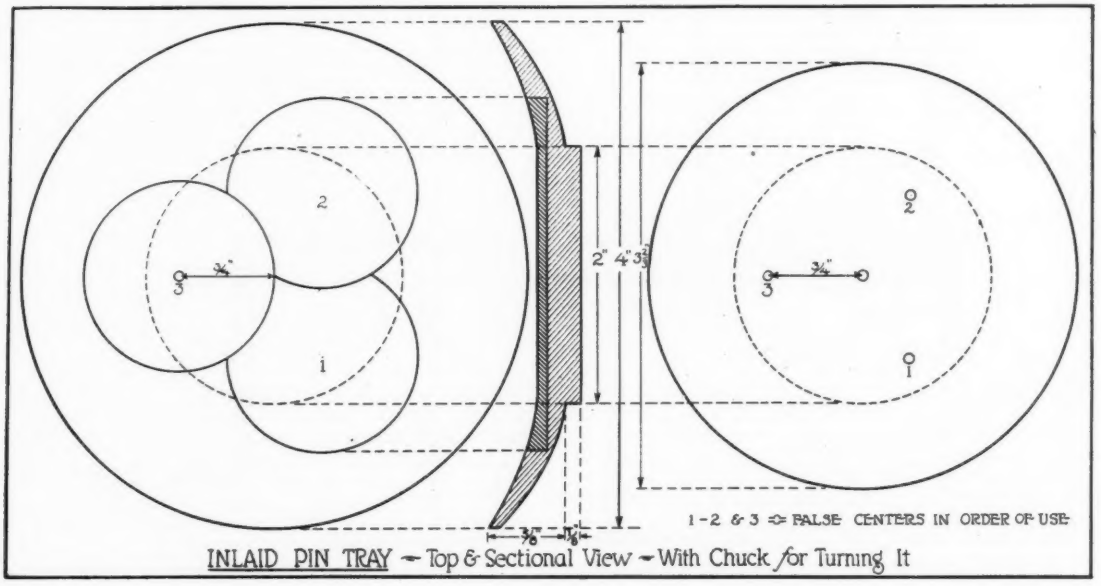
In this work several things must be kept in mind. The distance between the false centers and the true center on the chuck must not be greater than the size and the



DETAILS OF DRESSING TABLE IN THE ADAM STYLE.



HORSE SHOEING TOOL BOX



INLAID PIN TRAY — Top & Sectional View — With Chuck for Turning It

weight of the project and the swing of the lathe will allow, or the project will strike the lathe bed as it turns over. Also, if the swing is great and the project heavy there will be too much vibration unless a slow speed is used. A lathe with a six-inch swing will accommodate a four-inch project easily, if the false centers are not over one inch from the true center and if one of the slower speeds is used.

Pleasing variations in the designs may be produced by using four, five or six centers, or by using rings instead of discs for the inlay. Various combinations of woods may be used and different effects secured.

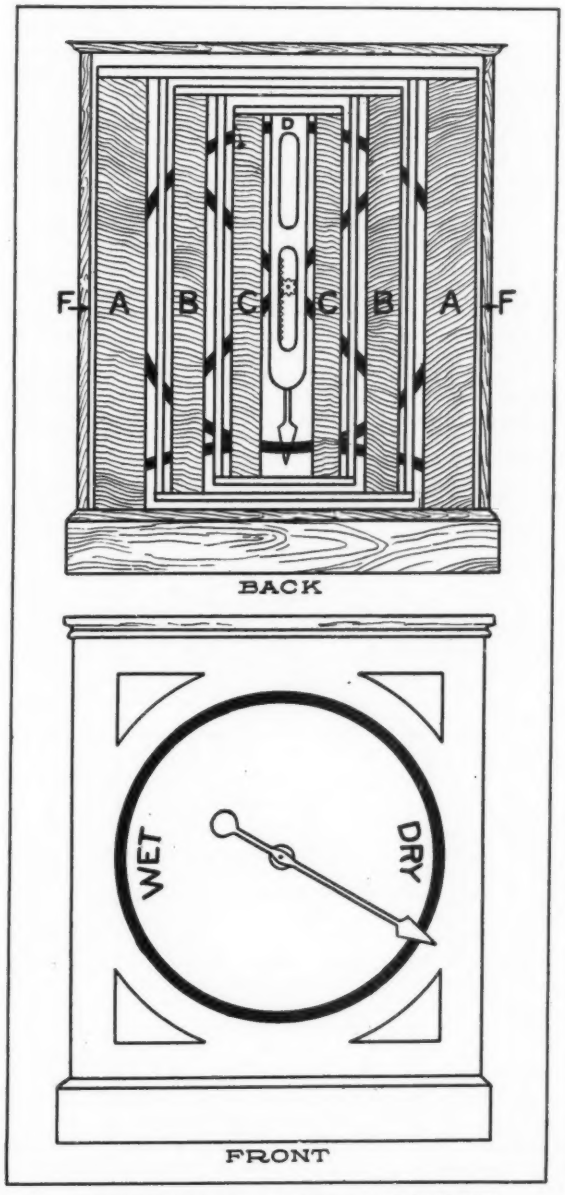
This work calls for accuracy and ingenuity in laying out the work and skill in working to exact dimensions.

TWO SIMPLE METAL PROBLEMS.

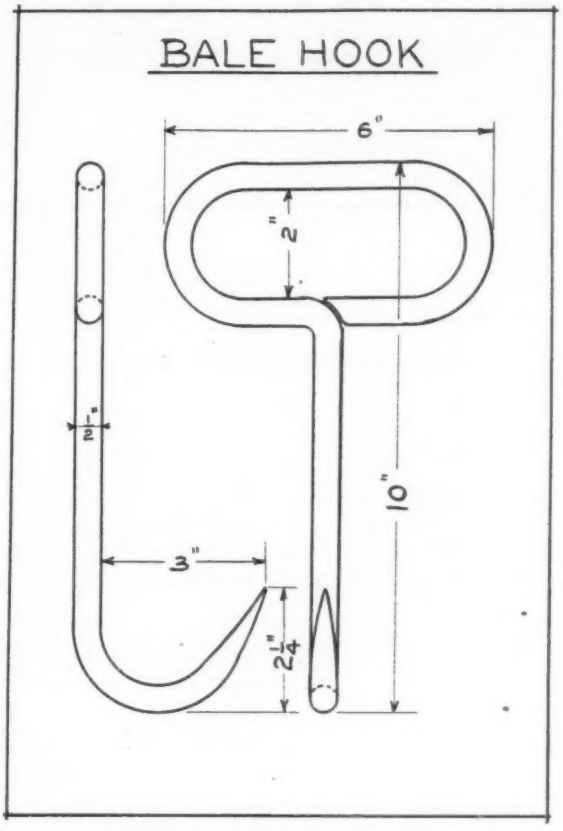
Eber L. Moore, Connersville, Ind.

Bale Hook.

The bale hook is a forging problem and is made of 7/16″ iron rod.



BACK AND FRONT OF A WOODEN HYGROSCOPE.



DETAILS FOR A FORGED BALE HOOK.

The handle should be formed first, making the longest bend first, then shape the side around the nose of the anvil. The hook may be turned next and finally sharpened.

Shoe Scraper.

The shoe scraper is made from 1/16″ sheet iron, 4½″ by 6″. The three feet by which it is fastened to the floor are made by sawing two kerfs 1½″ deep on the bottom side and bending the two outside sections one way and the middle section in the opposite direction.

The top is made with the saw and files.

A WOODEN HYGROSCOPE.

Captain E. Armitage McCann, Member American Meteorological Society.

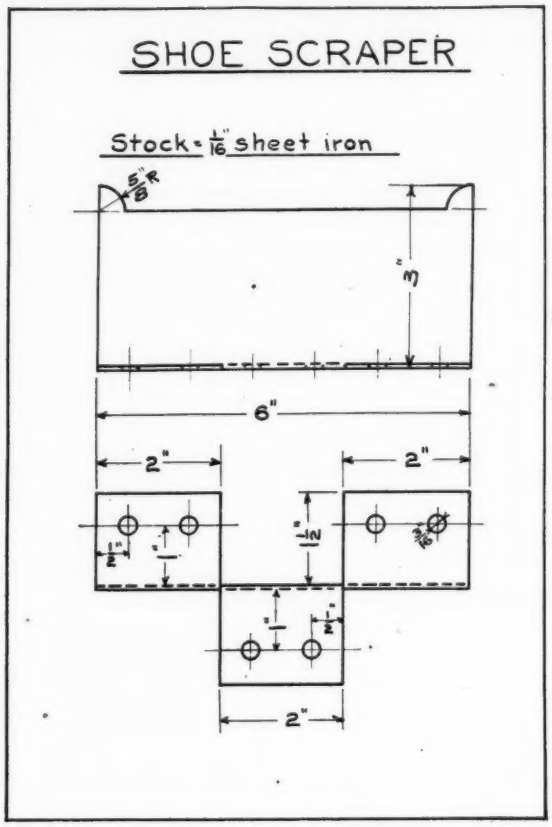
The accompanying sketch of what may be called a hygroscope makes a nice problem in woodworking. It is interesting to watch working without apparent effort, and will really foretell the weather to a certain extent. It thus gives manual training and leads to a general interest in meteorology.

I call it a hygroscope because it only *indicates* the dampness or dryness of the atmosphere, whereas a hygrometer, or a wet-and-dry-bulb thermometer, measures the amount of moisture.

It is based upon the well-known property of wood to expand more with moisture across the grain than with it.

I have not given any dimensions, but if the pieces marked A are made about 12″ by 3″ and the other parts in proportion it would make a good size; they may be half or twice that.

A, B and C are pieces of wood cut against the grain while the thin strips are lengthwise of the grain. When A expands with moisture it lifts the top cross bar up, which in turn lifts B, B expanding lifts its cross bar up a little more, which lifts C, it again lifting D in the center of which is a ratchet, which turns the cog of the pointer,



DETAILS FOR A SHOE SCRAPER.

so that when D lifts, the pointer swings to DRY and when it falls to WET. The movement is in proportion to the sum of the expansion of the whole three pairs of columns.

The view is of the back, with a metal ring indicated. This could be cut out of brass and fixed to the base, with radii to the center to hold the pinion of the pointer in place. It looks well like this if, say, two different colored woods are used, pine is as good as any for the columns, but hard wood can be used for the connecting bars and base.

If, however, a solid face is desired as shown in the other sketch it will be necessary to have a framework round the outside to support it as at F; the back in any case should be left open. If the wood you use is inclined to bulge, guides may be placed across the back and front, but they should not be tight enough to retard the movement. The columns should not be painted, varnished or oiled, and the whole should be well glued and screwed together; mortises may be used or not.

You will find that it takes up moisture rather quicker than it loses it, therefore wet weather and southerly winds will give longer notice than dry and northerly, and a small swing towards Dry is more important than the same amount towards Wet.

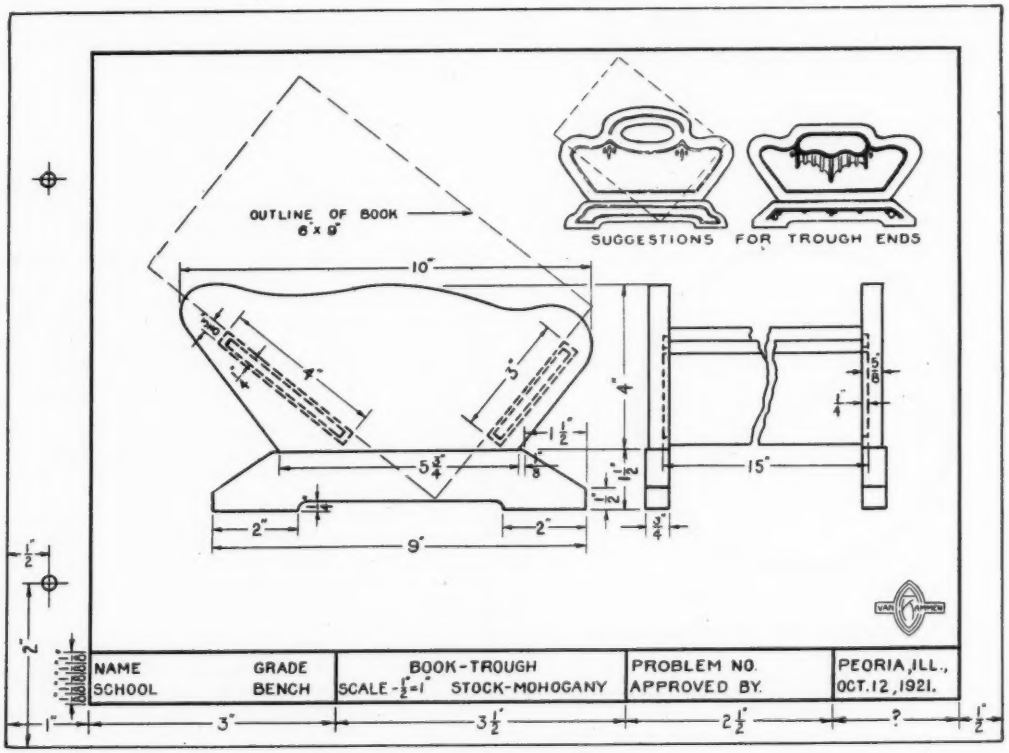
The rim may be marked with any kind of scale, so that you can more easily note how the pointer last stood. It is impossible to give any rules as to how much means what, as every instrument varies, you will soon learn by watching it.

BOOK TROUGH.

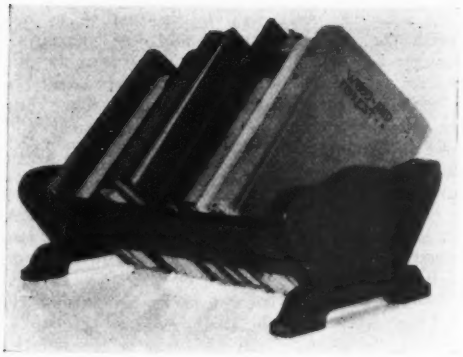
C. Anthony Van Kammen, Peoria, Ill.

Book racks and book ends have been offered in innumerable types and designs. However, knowing that a serviceable book receptacle of good design and finish is always acceptable for the library, I do not hesitate to send the design of a book trough.

The stocks most suitable for the problem are mahogany or walnut. Other woods can be used or the piece may be finished in polychrome. The trough illustrated is made



DETAILS OF A BOOK TROUGH.



BOOK RACK.

of mahogany finished dark red, the ⅛″ border on the ends made with a U shaped carving tool is lined in green. Other contours may be substituted for the present end designs.

After the ends are cut out and carefully matched, the inside faces should be marked so that the mortises will not be cut on the wrong side. Place a tag board templet, accurately laid out with the mortises at right angles as shown in the drawing, on the inside face of an end and mark with a knife the position of the mortises. The templet turned over and used on the other end will give the position of the other mortises. It may be well to cut the mortises after the tenons are cut to take care of any discrepancies in cutting the latter.

The bases are glued to the ends, using a butt joint as shown in the drawing, and are flush on the inside. Two or three finishing nails are used on the underside to save time and avoid clamping. Two clamps will draw the mortise and tenon joints up when gluing. Care should be taken to avoid any wind in the piece. This may be avoided by placing the work so that the bases rest on some true table until the glue has had ample time to set. When finished, pieces of green felt are glued to the base to prevent marring any varnished surfaces.

The stock bill for the above finished dimensions is as follows:

2 pcs. ⅝″x4″x10″, ends.
2 pcs. ¾″x1½″x9″, bases.
1 pc. ⅜″x4″x15″, trough back.
1 pc. ⅜″x3″x15″, trough front.

Attention is called to the form of title block used in the Peoria schools. All necessary information is included in the strip at the bottom of the drawing. The first space gives information about the student and his school. The second space gives the title or name of the object, the scale and the stock used. The third space includes the number of the problem and the mark of approval of the instructor. The final space gives the name of the city and state and the date the work is completed. A third line of printing could be introduced and the days, the hours of recitation, and the grade or mark of the drawing and the woodwork could be included, making the record still more complete.

We use 9″x12″ drawing paper and find this form of title block very satisfactory as it identifies the work when sent out on exhibition.

Teaching Boys Thread-Cutting

J. C. Nicholson, Los Angeles, Calif.

A good bright boy who has the unmistakable earmarks of a machinist in the making can be taught in two hours' time to cut a respectable thread with a lathe. This statement does not mean that he will know how to gear up a lathe for all sorts of odd pitches or that he will have learned for all time to set the tool properly or that he will be safe on internal threads or that he can forever after be trusted to do a good job on external threads. But it does mean that within that period he will have so mastered handling the lathe and gauging the size of cut to be taken as to be able to go on continuously cutting fairly good threads on ordinary soft steel. If for any reason he is taken from that kind of work before having extended practice and is not returned to it for weeks, he will probably have to be taught over before he can do nearly as well as when he left off.

It is intended here to treat only that part of the subject that has been suggested, though some others may not be wholly omitted.

In the first place, the boy must be shown how to use the index in gearing the lathe for different threads. Since, however, this is greatly simplified on most modern lathes, the matter may be quickly disposed of for the moment, leaving the real principles involved untouched. In fact, since the advent of inaccessible gear boxes one is tempted to say that the good old-fashioned principles of our fathers are now hidden away where nobody can get at them, even if he wants to. At any rate one's knowledge of screw-cutting gears is worth little to one who works on most lathes of these days. Hence the reason for giving it scant attention at this point.

But unlike this feature, the correct setting of the tool may not be shirked either here or at any time thereafter. It is, however, mainly a matter of training of the eye and observing the cut. The use of a gauge to avoid cutting a drunken thread should be taught, but aside from that, the main thing is to get the boy to take pains and be observing.

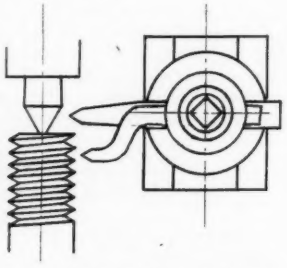
Of course at the start it is almost assumed that the job will be one on which the back-up is used or that the lathe has an index for catching the thread or that it has a reversible lead screw device of some sort. But, if any or even all of these aids are absent, it is still possible to handle the matter satisfactorily by simply fastening a piece of wire or pointed sheet metal in the tool post so that it leads two or three threads ahead of the tool proper and is not close enough to the work ever to engage the thread being cut. Such a makeshift is easily made and on external work is really just as good as an index, since it shows without fail just when the lead screw nut should be engaged. The sketch presented will make the matter clear enough without any further explanation.

Supposing then that we have disposed of these preliminaries, the actual business of operating the lathe is the next step. How shall the boy acquire this quickly? The answer is mainly by having a fair chance to learn. But what is a fair chance to learn? *It is a chance to apply one's attention singly to all the items involved, beginning with the simplest and leading by proper sequence to the highest, and finally to attend to the whole without error as a combination.* It is much easier to reach the desired result than the foregoing statement would seem to indicate, but there is a right way and a wrong way of going about it. The principles underlying the matter must be dealt with briefly.

Most young people—particularly those who will ever become skilled work-men learn very rapidly to go through any ordinary desired series of movements. For example, moving the belt shifter to left or right causes the lathe to run forward or backward respectively. A few minutes will usually serve to fix this in the boy's mind—no, not in his mind, but rather in his muscles, or in that part of him, wherever it be, that does things by habit. Where it is a matter of training certain muscles to act a certain way, as in the simple case just mentioned, it is some advantage to speak of getting the desired move-

ment as *registered* in the muscles that are to make it. For example, in the right hand is *registered* the movement of the shifter to right or left at the correct moment, while in the left is *registered* the movement of the cross-feed screw to right or left at the correct moment for feeding the tool toward or away from the work. Every such movement must be so *registered;* that is, fixed somehow so that the muscles in which it is registered, do the thing automatically without any effort on the part of the mind.

So much is perhaps clear. But it is only one half of the problem. Not only must *desired* movements be *registered,* but undesired ones must be got rid of somehow. Or better would it be to say that each *undesired* registration must be broken up and so destroyed that it will not at some unexpected moment return and cause havoc.[1] If, for instance, a boy has been running a machine in which moving the belt shifter to the *left* causes it to run *backward* and is taken to a machine where the opposite is the case, the *old registration* must be broken up and destroyed before any progress with the new can be made. And this is accomplished by carefully taking the matter entirely out of the realm of habit and making it a thing of careful attentive thought. The shifter is now carefully pushed to the *left* to make the machine run *forward* instead of backward and as this is done the learner is required thus *to think* of the result. By repeating this slowly at first, always making sure *to think* of the result that is soon to follow, then finally going through the matter more and more rapidly, the old registration is at last broken up and the new registration substituted in its place, after which the thing attends to itself automatically. But it is important that the exercise should be continued much longer than is necessary to get the right result at the moment; for the thing aimed at is to make sure that the old registration does not cause a mistake at a later time when the new one has partly been obliterated by an interval of time in which there has been no practice whatever. The desired registration must always be fixed more strongly than the undesired one. With young people this is an easy matter, but with the old it becomes difficult, so that sometimes an old registration will return years after it was made use of and do actual injury.



So much for the underlying principles. Let them be so applied as to give the boy the best possible chance to learn, as has been already indicated. To this end, each step should be carefully taken, avoiding everything that tends to cause nervousness or confusion, since this will cause mistakes to be made which in turn will make wrong registrations, and these, as we have seen, have to be destroyed before there can be any real progress. The problem is to teach the various movements one after another till all are mastered.

The best way to do this is for the teacher to operate the entire lathe at the start, then gradually turn over to the boy each part of the procedure one at a time. Suppose, for instance, that the lathe operates with a back-up belt. A good way to proceed is to have the boy push the shifter to right and left at signal while the teacher is cutting a thread. Have him do this firmly, yet not nervously with his right hand until he can do it with entire satisfaction and ease. Then have him repeat this observation a number of times, and then his own judgment. When he has got this in good shape, let the teacher take the shifter and give the boy the crossfeed to operate in his *left* hand. Assuming that there is no compound rest on the lathe, the best method for gauging the cut to be taken is to chalk mark the crossfeed handle. Have the boy observe the position of the handle when the tool is cutting. Next have him run the screw to the correct mark for taking the next cut. Then have him do this and the teacher actually take a cut, the teacher still reserving to himself the withdrawing of the tool at the correct moment. When this has been mastered, teach the boy to withdraw the tool also. Then give him both shifter and feed screw, but let the operator also take hold of the shifter with him. Tell him he is to operate the screw only, the teacher still attending to the shifter. If he fails, the teacher merely stops the lathe and the trial is repeated. He will soon learn to handle the screw with the shifter in his other hand. When this is accomplished, let him also move the shifter, the operator still holding to it, however, to avoid possible accident. He will soon get the last step and then after a little caution and encouragement with occasional slight corrections will be able to go it alone. Of course, throughout the entire procedure quiet, simple instructions should be given. The boy is to learn *movements,* not words, and the fewer words the better, so long as he understands what is wanted.

When a boy has learned to cut a thread, he ought to be continued at it for some hours, or even for days is better, so as to fix the movements more firmly, the teacher now and then watching for lapses into crudenesses that are always tending to return during moments when attention or pride flag just a little. In fact the ideal would be a series of thread-cutting exercises including everything in that line, these exercises at the same time being on a commercial product. A great deal can be accomplished in a short time by this means. For instance, after a time the boy may be taught to dispense with chalk marks on the screw handle and mark its correct position by the position it has in his hand, so that he learns to feel for the correct position rather than look for it, thus leaving less for his eyes to do. Continued practice under competent instruction soon develops great skill. Or again, if there is a compound rest on the lathe, teach him how to swing this around to about 29 degrees and use the compound rest screw for gauging the cut to be taken and running the main cross slide against a stop or otherwise fixed point. The subject includes many variations, yet they are soon mastered if both instructor and pupil are painstaking and apt to learn.

Yes, a bright boy with the growing earmarks of a machinist can be taught in two hours to cut a respectable thread with a lathe.

[1]In any well ordered shop all the lathes are consistent in regard to belt shifters. The case mentioned is intended for illustration only. Also it is assumed that in no case will a boy's first job on a lathe be one of thread-cutting. As a matter of fact he should first acquire a large familiarity with the lathe while doing simpler work.

OKLAHOMA REQUIREMENTS FOR MANUAL TRAINING TEACHERS.

The State Board of Education of Oklahoma has recently adopted regulations governing the issuance of manual training certificates and outlining the shop and educational courses and the number of semester hours to be completed by those seeking certificates to teach. The subjects of the courses and the number of hours for each are given as follows:

Shop Courses.

Subjects	Cr. Hours
Bench woodwork (hand woodwork)	2
Machine Woodwork	2
Wood turning and pattern making	2
Care of shop equipment	1
Carpentry (framing and rafter cutting)	2
Methods of teaching manual training	2

Forging	2
Any other metal work course	2
Total	15

Drawing Courses.

Subjects	Cr. Hours
Furniture design	1
Elementary mechanical drawing	2
Machine drawing	2
Architectural drawing	2
Orthographic projection	2
Total	9

Other Subjects.

Subjects	Cr. Hours
Education	8
Subjects required by the institution	32
Total	64

The rules provide that the state board, upon proper application, will issue life certificates to teach manual training to teachers who have completed 64 semester hours of work at any of the state normals, the state university, the A. & M. College or other accredited institutions, which work must include eight hours in educational courses and work in the several shops.

Teachers of special subjects in the high school shopwork, that is, forging, automobile mechanics, electrical construction, machine shop, foundry, mechanical drawing, and sheet metal work will be subjected to the requirements above, except that they will be required to substitute courses in their specialty in place of woodwork and drawing courses.

Teachers who have not fully met the requirements for permanent certificates but whose credentials show that they have done at least one-half of the required work (32 semester hours) at the beginning of the school year 1922-23, may be issued certificates for one year, and the certificate may be renewed for 1923-24 provided the holder attends an accredited institution and earns eight semester hours of credit in shop courses before the term 1923-24. Such certificates may be renewed for 1924-25 on the same basis.

Beginning with September, 1922, the state board and the high school inspectors will not approve manual training in any high school in Oklahoma where the manual training teacher has not secured a state certificate to teach manual training.

MR. HARRY WOOD,
Director of Vocational Education,
Indianapolis, Ind.

Beginning with September, 1925, the state board will not approve manual training in any high school of the state where the manual training teacher has not secured a permanent certificate to teach manual training.

Beginning with September, 1922, the high school inspectors and the state board will not approve manual training in any high school in Oklahoma where the equipment does not measure up to the minimum for one year's work, or one unit; two years' work, or two units; three years' work, or three units; or four years' work, or four units as set by the high school course of study.

Teachers who have had six years of successful experience teaching manual training may be granted permanent certificates, provided they have attended summer school

H. ESTELLE HAYDEN,
President, Western Arts Association,
Des Moines, Ia.

in an accredited institution and have done work in manual training every other summer for a period of six years, provided that no teacher shall receive a permanent certificate who has not completed a minimum of sixty hours of college work.

Applications for manual training certificates must be filed with the secretary of the state board of education upon blanks furnished by the board.

ELECTED PRESIDENT.

Miss Harriet Estelle Hayden, who was elected president of the Western Arts Association at its annual meeting in Cincinnati, on May 2nd, has been director of art for the past four years at Des Moines, Ia.

Miss Hayden was born in Wisconsin and received her early education in the schools of the Badger State. She is a graduate of the Oshkosh Normal School and of the normal art department of Pratt Institute. Miss Hayden was for many years assistant principal and departmental teacher of art, music and literature in the schools of Oshkosh, and was for four years assistant supervisor of art at Indianapolis, Ind. She also taught normal and scholarship classes at the Herron Art Institute.

HARRY WOOD PROMOTED.

The Indianapolis board of education has recently advanced Mr. Harry E. Wood to become director of the unified department of vocational education and manual arts. Mr. Wood has been for eleven years past supervisor of manual training and now takes charge of all vocational and shop work for the city schools.

Mr. Wood was born at Lexington, Ill., in 1879 and received his professional education in the Pennsylvania school of Industrial Art, Cornell University, and Indiana University. He has been connected with the Indianapolis schools for 21 years as teacher and supervisor. He is the author of numerous professional magazine articles and has been a leading spirit in the Western Arts Association.

Shop Work at Dillon, Mont. Much interest has been created in the manual training work at Dillon under the direction of Mr. J. Scott Wiseman, instructor, by a series of production problems. A cabinet with thirty drawers, a tool room with cabinets and wall space, an amphitheater with cabinets for supplies, a cabinet with paneled door lockers, were among the projects completed during the year. The boys figured the bills of material, laid out the work, got out the stock, made the jigs, assembled and finished the work using approved production methods.

COMMON STYLES OF WOODEN BOXES.

There are seven forms of nailed wooden boxes so universally used that they may be called the standard styles of nailed boxes. These boxes can be adapted to a wide range of uses, and it is the experience of the Forest Products Laboratory that in meeting the majority of packing problems they are the most efficient of the nailed boxes. The advantages and disadvantages of each style, as revealed in laboratory tests and observations of boxes in commercial service, are given below.

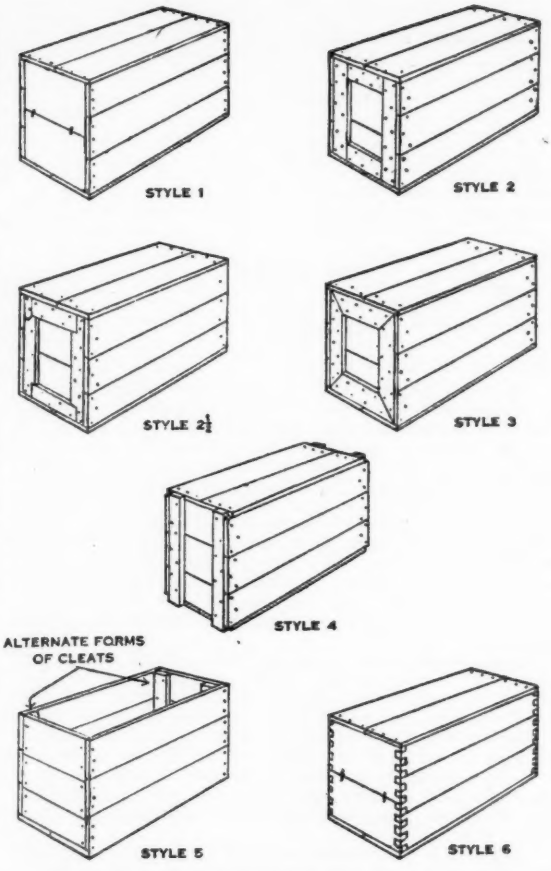
In style 1, the grain of the ends and sides runs approximately parallel to the top and bottom surfaces. One of the common failures in this type of box is splitting of the ends and sides, or failure of the joints in these parts, since the only resistance to such failure lies in the strength of the joints, if present, or in the strength of the wood in tension across the grain, which is not large and is extremely variable in any species of wood. The smaller holding power of nails driven into end grain as compared with side grain is another source of weakness.

To improve on style 1 ends, and guard against the liability of complete failure from splitting of ends and sides, rectangular and sometimes triangular corner cleats nailed to the inside of the end (style 5) are added when the character of the contents permits. This construction does not increase the displacement of the box and is, therefore, not objectionable in this respect. If these cleats can be made large enough, the sides may also be nailed to them, which, of course, increases the strength of the nailing at this point. These inside cleats should be shorter than the inside depth of the box, so that if the sides and ends shrink, the cleats will not cause an opening of the joints. In all boxes with cleated ends, the nails holding the cleats to the ends should be long enough to permit a good clinch, and should be spaced approximately the same as the nails in the adjacent edges of the box.

The most common method of preventing box ends from splitting and of supplementing the holding power of nails driven into the end grain is the addition of two outside cleats on each end as shown in style 4. These cleats should be of the same thickness as the end so that the same size of nail may be used in them. The nails should be staggered in the ends and cleats; this permits a closer spacing of the nails and results in a stronger joint than is obtained by driving the nails in a single row. The holding power of the nails is supplemented most effectively by the use of denser woods in ends and cleats.

The cleats in style 4 boxes should be long enough to come nearly flush with the outer surfaces of the top and bottom. They will thus aid in keeping the top and bottom in place and will also take some of the thrust which comes on the nails in the top and bottom when the box is dropped on a corner. If the cleats are made to come exactly flush with the outer surfaces of the top and bottom, the shrinkage occurs later, it may cause the ends of the cleats to project beyond the top and bottom, and they may be pulled loose if the box is handled so that they catch on some object. The amount that the cleats should be cut short to allow for shrinkage depends on the moisture content of the lumber at the time the box is constructed and the storage conditions afterward. Usually an allowance of from $\frac{1}{8}$ to $\frac{3}{8}$ inch at each end will be sufficient.

The addition of the two horizontal cleats in styles 2, 2½, and 3 permits a reduction in the thickness of the end boards from the thickness of the cleats to that of the sides, top, and bottom, in which case all the nails should be driven into the cleats. Or the cleats and end boards may be the same thickness and the nails staggered in two rows. The usual failures in these styles of boxes are pulling of the nails from ends and cleats, shearing out of the nails to the ends of the sides, top, and bottom, and splitting of the end boards along the inner edges of the horizontal cleats, which allows a cleat with part of the end board to pull away with the top or bottom. The resistance to failure by splitting of the end is due to the strength of the end board in tension across the grain, supplemented by the action of the vertical cleats. In nailing the vertical cleats to the ends in styles 2 and 2½, it is possible to get more nails near the top and bottom edges of the box than in the mitered cleats of style 3. This more effectively prevents the box end from splitting along the horizontal cleats.



Style 2½ has the advantage that when the bottom and top are being nailed to the cleats, the notches or steps in the vertical cleats will take the thrust that otherwise would come on the nails holding the horizontal cleats. This thrust is sometimes very severe, especially when several nails are driven at the same time into a cleat made of dense wood.

In manufacturing boxes with square ends, style 3 has the advantage that all four cleats are the same length, hence interchangeable. When a very symmetrical end is desired rather than the strongest end, the mitered cleats are preferred.

The box shown in style 6 has sides and ends joined together by a series of tenons, called "locks", which interlock and are held together by gluing. The top and bottom are usually fastened by nailing. The lock corner, if properly glued, gives a more rigid box than nailed corners, there being no appreciable distortion before failure occurs. Tests show that many failures in lock-corner boxes occur because ends and sides split, nails pull from or split the edges of too thin ends, locks open, and matched joints lack sufficient strength.

Manual Training for Elementary Teachers. The University of California, in its summer school, is offering a teacher-training course under the direction of Mr. Charles A. Kunou, supervisor of manual training at Los Angeles. The course has for its purpose the training of teachers for work in the elementary school shops and the provision of means whereby teachers may better themselves. The course which forms part of the work offered in vocational education and carries a credit of two units, embraces the principles of art and design for teachers of the mechanic arts; the history of the development of manual training involving the principles determining the course of study and the objectives of student activities; laboratory work in the making of type objects and the application of principles of design to modes of coloring and finishing. The entire work is being offered in cooperation with the teachers of Southern California.

NOW, ARE THERE ANY QUESTIONS?

This department is intended for subscribers who have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from competent authorities. Letters must invariably be signed with full name of inquirer. All questions are numbered in the order of their receipt. If an answer is desired by mail, a stamped envelope should be enclosed. The privilege of printing any reply is reserved. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Aging Maple.

282. Q: I am converting an old bird's-eye maple chiffonier into a dressing table and would be glad to receive any suggestions as to the aging process of the new wood, so as to make it harmonize with the older wood of the chiffonier.—M. H. G.

A: Practically any tone of maple from antique to modern maple may be produced through the use of orange shellac reduced one-half to three-quarters with denatured alcohol. This very quickly gives that old age tone which heretofore has been produced by time and oil varnishes. High lighting on turned work can be produced by sanding off the shellac coloring with 0000 sandpaper on such portions as would naturally show considerable high light. This is especially true of turned work. Where this high lighting, however, is not desired, careful sandpapering with a split 0000 paper will produce a very even result. After dusting off, a coat of Pratt & Lambert's 61 Floor Varnish or similar dark colored varnish will further enhance the effect of age. This should be sanded carefully, dusted off and revarnished for at least two coats, the last of which should be rubbed out with felt pad, FF pumice stone and water and cleaned up with a good polish.—**Ralph G. Waring.**

Mahogany Finish.

284. Q: Please send directions for obtaining a good mahogany color or finish on cherry and oak. How can I get a good deep brown finish on cherry and poplar?—H. L. R.

A: To obtain a mahogany finish on oak and cherry, first treat the woods with a solution of potassium bichromate dissolved at the rate of two ounces per gallon of boiling water. Upon exposure to the air for twelve hours, the stained wood will assume a rich brown tone. Any raised grain should be sanded smooth and a second coat of stain applied, made from two ounces of Bismark brown, dissolved in one gallon of boiling vinegar. This will give a full red tone which can be shaded to any quality by the addition of a slight amount of water soluble Black J. A rich brown tone on poplar can be produced from the first stain which has been second coated with a two ounce to the gallon solution of tannic acid in water. Exposure to the air overnight allows the carbon dioxide present to develop a rich tone of brown. This can be altered somewhat by treating with the coat of linseed oil reduced with two volumes of turpentine with a small amount of dark Japan drier, as a teaspoonful to a quart of the mixture. This should be allowed at least three days drying and should then be given a size coat of orange shellac. Sanding and varnishing may follow if desired.—**Ralph G. Waring.**

Antique Adam Finish.

289. Q:—I have an Adam chair which I made from the sketch shown on page 323 of the August, 1917, number of your magazine and would like to know how to finish it so as to produce, as near as possible, the Adam finish with an antique effect. The chair is made of American walnut and is entirely hand carved. Would you also please advise me on how to remedy a cracked panel in a red gum chest which has been finished in Circassian walnut. The panel opened up at a glue joint due to improper seasoning of the lumber and cannot be removed without destroying the chest. The chest has a dull varnish finish. —W. M. S.

A:—The Adams Bros. were users of a good deal of varnish and thorough rubbing and polishing in the production of their furniture. Because of this fact, authentic pieces of theirs have been preserved with much of the original lustre still remaining on the specimens of their handicraft. If therefore, you wish to produce a true Adam finish, you will not have any so-called antique effect, as Adams Bros. finish was far brighter and clearer than anything produced in the shops today. It will be necessary to sponge the wood with water to raise the grain and open the pores. When thoroughly dry it should be sandpapered with very fine paper and dusted off. A coat of Universal Brown stain should then be applied and when dry should be followed without sanding with a size coat of orange shellac, reduced to consistency of water with denatured alcohol. This should be allowed five hours to dry, then carefully sanded with a split 0000 paper.

The filler should be made up of silex, Van Dyke brown, burnt umber and burnt sienna to match the wood as closely as possible. After cleaning off thoroughly, it should be allowed 48 hours to dry and then should then be given a brush coat of Pratt and Lambert No. 61 or equal floor varnish as furniture should be always finished with a tough, moisture resisting varnish. After drying three days this coat may be sanded with a split 0000 paper and after dusting off, should be revarnished. This may be repeated up to four coats and the last one rubbed out with FF pumice stone, felt pad and water, using a rubbing brush on the carved work. After thoroughly washing down the whole piece should be cleaned up with a good oil polish. If you desire to imitate the so-called antique dusty walnut, which at the present time is somewhat in vogue, you may stain the chair and after drying brush on a hot coat of linseed oil (raw) one part, turpentine, two parts, and dark japan drier one teaspoonful to one pint of the above mixture. This should be allowed three days for drying and the whole piece should then be sifted over with powdered rotten stone enclosed in a single thickness of cheese cloth. A clean piece of cloth should then be used to rub this dry rotten stone into the pores of the wood, thereby giving it a gray color effect, such as might be produced by the accumulation of dust over a long period of time.

The only remedy for a cracked panel in a gum wood where the panel cannot be removed, is to varnish the inside edges of the crack thoroughly so as to prevent the absorption and discoloration of the wood, of the oil from the putty which should be made from whiting, two parts, white lead, one part; with varnish as a binder, using a few drops of raw linseed oil to enable it to come clean from the glazing knife. The putty should be tinted to match the wood and should be allowed to overfill the crack slightly in order that it may be cut down to a level surface when dry and hard, which will take about a week. It should then be sanded to a perfectly smooth surface and the panel revarnished to match the rest.—**Ralph G. Waring.**

Finish Over Oil Stain.

285. Q:—I have had some trouble with some gumwood which has been in the manual training room for several years. Recently I worked it up into a smoking cabinet and wanted a finish of mahogany stain. I applied two coats of stain each of which I rubbed in thoroughly and then allowed to dry for two days in the shop, which is kept at a uniform temperature all the time. I then varnished it, using a standard varnish. After three days it was not dry, and at the end of a week, it was still sticky. To date, after nearly two weeks, the varnish is in just the same condition that it was at the end of the first week. I used an oil stain on it. Can You tell me what is the trouble and suggest a method of taking care of it, so that it can be finished up properly?—N. B.

A:—The failure of the finish over an oil stain is typical of troubles of this type and is one of the basic reasons why I have spent so much time and energy to get finishers of all classes to keep away from the many pitfalls attending the use of spirit and oil stains. Whenever a man uses these materials he has been sold entirely on the point that these materials do not raise the grain. This bugbear has assumed undoubtedly large proportions in the eyes of the inexperienced, with the consequence that many find themselves involved in troubles similar to those of the questioner.

Continued trade and laboratory experience have thoroughly convinced me that water stains properly compounded offer the only approach to a "fool proof" material. Stain materials in oil or spirits are very seldom in solution, in the sense that sugar dissolves in water, but are merely very fine suspensions of the dye in the liquid. Due to this fact, the color piles up on the surface of the wood when dry, thereby causing "bronzing" effects. Upon application of varnish or shellac, the dye materials either lift or bleed through. Especially is this true when

the oil contains appreciable quantities of petroleum distillate or naptha containing napthalene. Either of these materials makes an extremely dangerous foundation for the production of a satisfactory finish, since they frequently enter into chemical combination with varnish and completely destroy the activities of the drying agents.

The remedy in a case of this kind—and it is the only remedy which the questioner can apply—is to strip the finish with a varnish remover and alcohol (denatured). Allow the piece of furniture to dry two or three days and then sand to a fresh surface. Stain with a suitable water stain to which a little alcohol has been added to aid in penetration. Allow 24 hours for drying. Size with orange shellac reduced one-half with alcohol and when dry sand with split 0000 paper. Varnish for a finish.—**Ralph G. Waring.**

NEW BOOKS.

Mechanical Aptitude Tests.

By J. L. Stenquist. Tests I and II. Specimen Set, 30 cents postpaid. World Book Co., Yonkers-on-Hudson, N. Y.

These tests are of the familiar picture type and require on the part of the student an understanding of mechanical relationships of common devices and machines. They have been developed on the theory that there is no accurate relationship between general intelligence and mechanical ability, but many boys who have marked natural talent along mechanical lines may show a low I. Q. according to academic and general tests. The author has selected his materials from the widest possible range of common devices and machines and has carefully graded the problems so that they can be used in city and rural schools. Test One is entirely a picture test and involves common tools, household devices, machine parts, electrical devices and other articles of common use. Test Two requires answers to simple questions based on mechanical operation of pictured machines and devices.

The tests have been tried out in New York City with more than two thousand pupils above the fifth grade.

A Hundred Things a Girl Can Make.

By Bonnie E. Snow and Hugo B. Froehlich. Cloth, 147 pages, illustrated. J. B. Lippincott Co., Philadelphia, Pa.

The title of this book hardly gives a clue to its attractive, artistic and useful contents. It suggests a hundred things to be made in felt, cardboard and paper, wood, textiles and to be painted or decorated. Each article is first of interest to girls, secondly of distinct usefulness and finally artistic in design and coloring. The authors have drawn upon their long experience as teachers to find articles which have been made in schools or homes and which have been successfully made and used. Many of the articles are of their original design; others have come from art supervisors, sewing teachers and from students. Each article is illustrated by means of a wash drawing, patterns of the several parts and sketches of the chief steps or processes of construction. The directions for making are detailed. There are numerous suggestions for adapting details to individual use and for developing original shapes, decorations, colorings, etc.

It is interesting to note that the material on felt novelties, dowel dolls, fish kites, have appeared in the Industrial-Arts Magazine.

The Expert Typist.

By Clarence C. Smith, Cloth, 274 pages. The Macmillan Company, New York, N. Y.

This book addresses itself to the typist who desires to become expert. It begins by broadening the knowledge of the typist by analyzing the construction of the typewriting machine and its possibilities. How to use the machine, how to develop speed and how to get the most out of it forms the essence of the text.

Much suggestive information is also given on office detail relating to the stenographer's work designed to strengthen efficiency and service.

Practical Physics.

By N. Henry Black and Harvey N. Davis. Cloth, 555 pages, illustrated. Revised edition. The Macmillan Co., New York, N. Y.

This volume is a revision of a book first issued by the authors in 1913. They have now entirely rewritten it, have provided new illustrations, and have added much new material taken from new advances in science and industry. The changes and improvements in the book have been largely suggested by the users of the book and are based upon practical classroom experience.

The book appeals to us as especially desirable for vocational schools and technical high schools. It is complete and clear in presenting the principles and theory of the science, and it is quite fulsome in showing the useful application in familiar devices and machines. Each subject is followed by a series of practical problems and each chapter is concluded with a summary of principles, a group of questions and a set of exercises. The book is well illustrated and well printed.

Architectural Drawing.

By Oscar S. Teale. Cloth, 235 pages, illustrated. Third Edition. U. P. C. Book Co., Inc., New York, N. Y.

This book, of which the present copy is the third edition, is intended to teach beginners the elements of drawing as applied to architectural uses. It does not pretend to teach building construction, planning or design, but limits itself almost wholly to the correct mechanics of drawing. Thus nearly 65 pages are devoted to an account of drawing instruments and their use, 25 pages to descriptions of the commonly used types of drawings and practical methods of laying out drawings, and sixty pages to geometric principles employed in drawing. The balance of the work consists of applications of the principles learned to typical details. Attention is also given to lettering, accepted conventions and good practice. The book appeals to us as most useful for reference and for collateral study in connection with a well-planned course in drawing. For the latter use, it will serve to fix permanently in mind many principles and definitions, which are only mentioned casually or passed over altogether.

Modern Glues and Glue Handling.

C. H. Teesdale and C. M. Bezeau. Flexible leatherette, 192 pages, octavo. The Periodical Publishing Co., Grand Rapids, Mich.

Two glue experts—one a technical laboratory specialist and the other a practical user of glues, with many years' experience—have written this welcome book. The first half takes up the various kinds and grades of glues and their uses and describes the technique of testing glues, writing specifications, grading glues, etc. Much of this part of the book is based on Mr. Truesdale's experience in the U. S. Forest Products Laboratory and represents data and conclusions that are peculiarly comprehensive and conclusive. In the second part of the book the preparation and use of glue in cabinet and general woodworking are taken up. The viewpoint is that of the glue room in the furniture factory and the treatment is decidedly advanced.

The book will be of interest to teachers of cabinet-making and advanced woodwork. While it omits the statement of many simple methods and useful "kinks", which teachers are in need of, it presents all the essential facts and the newest practice in readily usable form. It is to be regretted that the publishers have failed to add a comprehensive index.

Sheet-Metal Pattern Drafting and Shop Problems.

By James S. Daugherty. Cloth, 173 pages, illustrated. The Manual Arts Press, Peoria, Ill.

The chief merit of this book is its simplicity, logical arrangement and clear statement of the shop method of making sheet metal patterns. Quite as valuable is the series of 114 simple typical problems presented to illustrate the drafting methods which are advocated.

It is not clear to the reviewer that the arrangement is the most teachable possible from the standpoint of sheet metal working. From the drafting point of view it is certainly logical, but it may be doubted whether the average instructor will not want to use more of the spiral method of teaching, so that his classes get an understanding, quite early in their experience, of all the simple, general principles, coming back to the more complicated applications later. These latter elaborate pattern types are correspondingly difficult in construction and would seem to be of interest after a general understanding of the whole scope of the work, and some skill in making pieces has been developed.

The book appeals to us most strongly for the journeyman and advanced apprentice who desire a reference book "to keep for use on the job". Teachers will find it a vast source of problems for the drafting room and the shop.

The plates are excellent and the typography above the average.